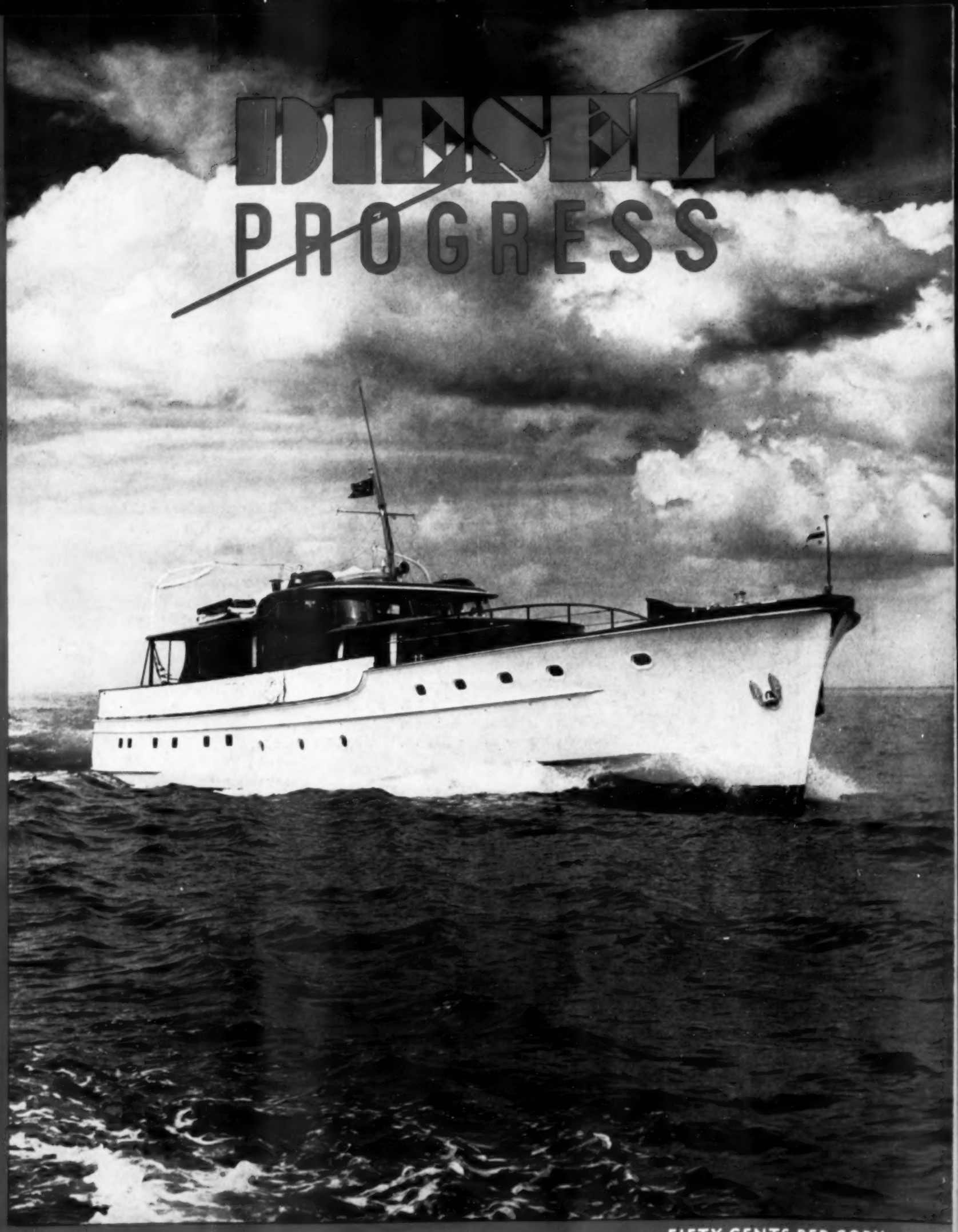
# DIESEL PROGRESS

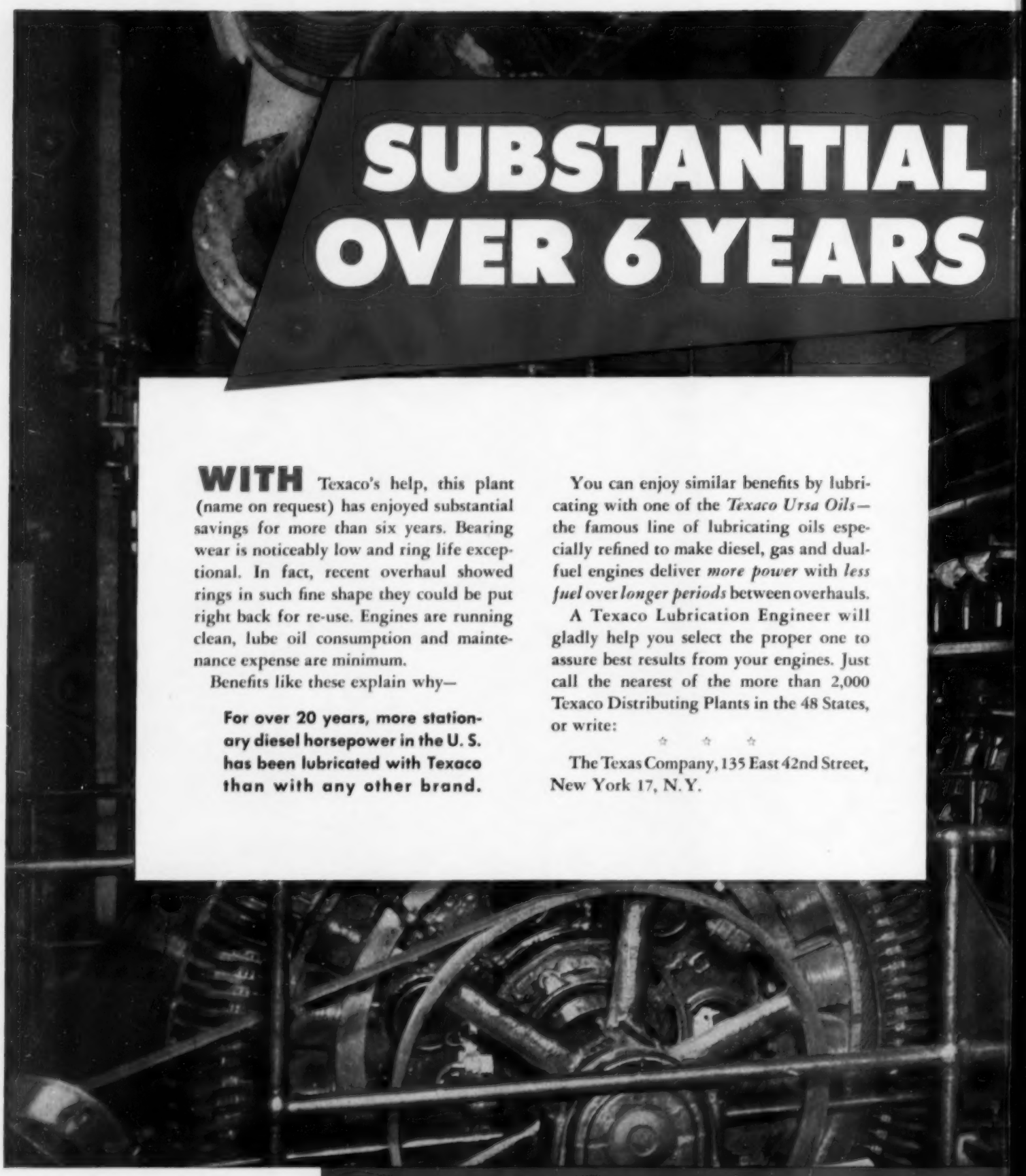
IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

APRIL, 1955

FIFTY CENTS PER COPY



# SUBSTANTIAL OVER 6 YEARS

**WITH** Texaco's help, this plant (name on request) has enjoyed substantial savings for more than six years. Bearing wear is noticeably low and ring life exceptional. In fact, recent overhaul showed rings in such fine shape they could be put right back for re-use. Engines are running clean, lube oil consumption and maintenance expense are minimum.

Benefits like these explain why—

**For over 20 years, more stationary diesel horsepower in the U. S. has been lubricated with Texaco than with any other brand.**

You can enjoy similar benefits by lubricating with one of the *Texaco Ursa Oils*—the famous line of lubricating oils especially refined to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls.

A Texaco Lubrication Engineer will gladly help you select the proper one to assure best results from your engines. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N.Y.

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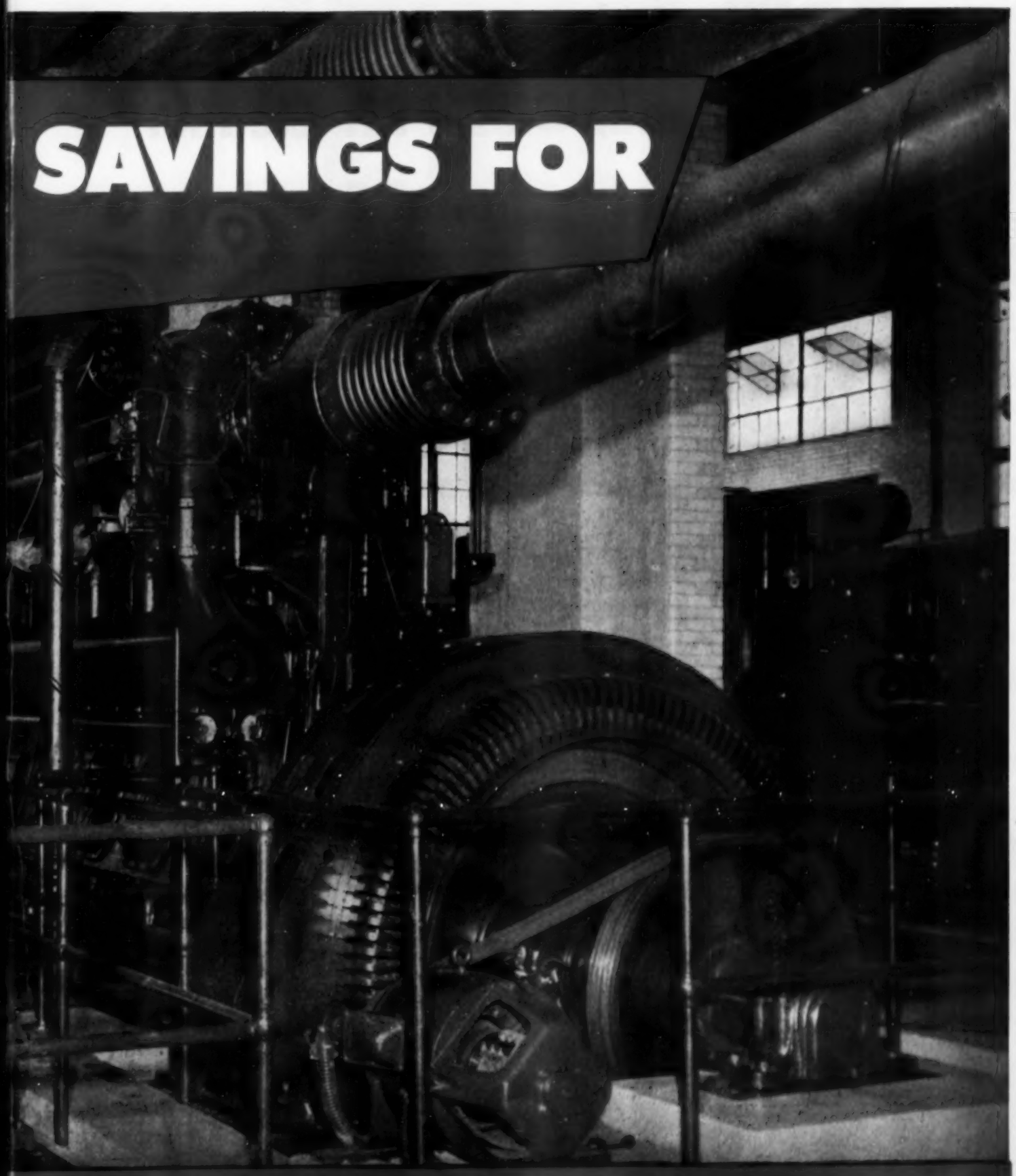
TEXACO STAR THEATER
starring
DONALD O'CONNOR
or JIMMY DURANTE
on television...
Saturday nights, NBC.

TEXACO

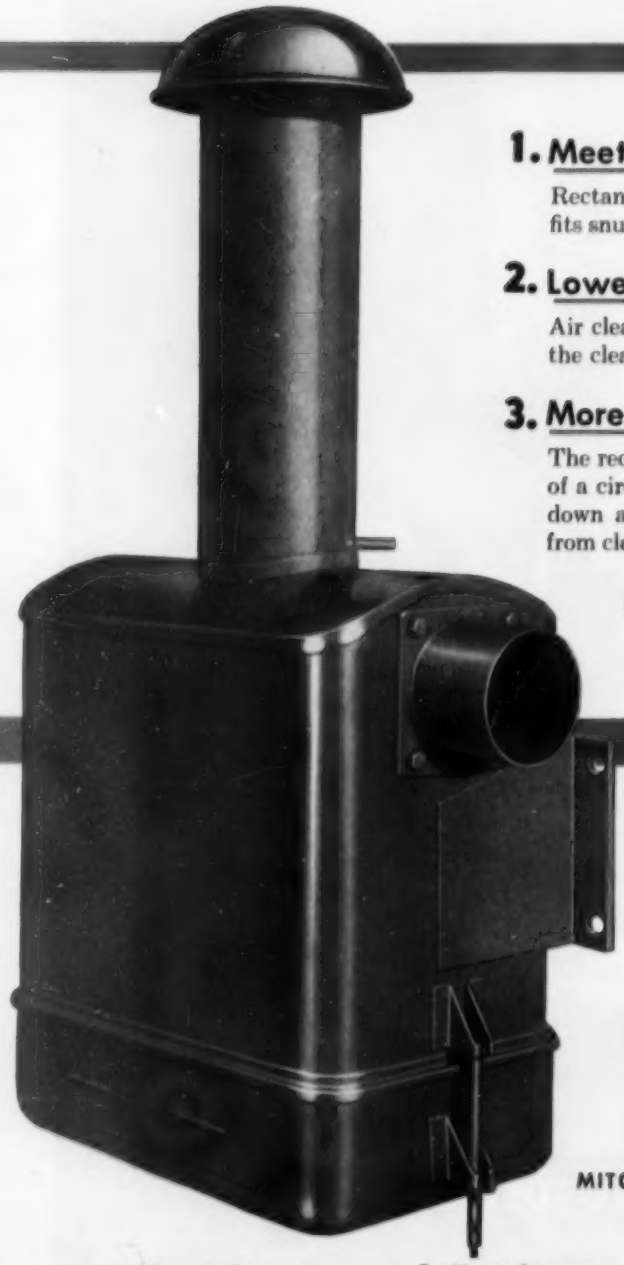
TEXACO


SAVINGS FOR
URSA OILS
FOR ALL DIESEL, GAS
AND DUAL-FUEL ENGINES

# NEW

# United Rectangular Diesel Air Cleaner Helps International Crawlers Breathe Easy

This new United Specialties rectangular diesel oil bath air cleaner, installed on International TD-24, TD-18A and TD-14A crawler tractors, provides major improvements in air cleaner design and operation.



**1. Meets Limited Space Requirements**

Rectangular shape of air cleaner conforms better to engine shape — fits snugly under hood — makes most efficient use of available space.

**2. Lower Installation Cost**

Air cleaner outlet can be taken at any point around the perimeter of the clean air chamber, providing the shortest connection to manifold.

**3. More Air Volume**

The rectangular cleaner, with sides of the same length as the diameter of a circular cleaner, contains far more surface area. This helps slow down air velocity through cleaner, safeguards against oil carryover from cleaner to engine.

**4. Simple Maintenance**

Removable scrubber element can be easily detached for cleaning.

United Specialties welcomes the opportunity to provide International crawler tractors with the newest and finest in oil bath air cleaner protection.

## UNITED SPECIALTIES COMPANY

UNITED AIR CLEANER DIVISION — CHICAGO 28, ILL.

MITCHELL DIVISION — PHILADELPHIA 36, PA. • BIRMINGHAM, ALA.

Air Cleaners · Metal Stampings · Rolled Shapes · Ignition Switches · Turn Signal Switches · Dovetails

# DIESEL and GAS ENGINE PROGRESS

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IN INDUSTRY · IN TRANSPORTATION · ON THE SEA · IN THE AIR

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**EDITORIAL AND PRODUCTION OFFICES**

816 N. La Cienega Blvd. Los Angeles 46, Calif.

**BUSINESS OFFICES**

NEW YORK 20:
DIESEL PROGRESS
604 Fifth Ave.
JUdson 6-4820

CHICAGO 2:
Bruce Wadman
30 N. La Salle St.
Suite 940, Office #1-B
DEarborn 2-3533

LOS ANGELES 46:
Sidney Hoffman
816 N. La Cienega Blvd.
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4-5555

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Business Publications Audit of Circulation, Inc.

DIESEL PROGRESS for April, 1955, Vol. XXI, No. 4. Published Monthly by Diesel Engines, Inc., 816 N. La Cienega Blvd., Los Angeles 46, California. Tel-BRadshaw 2-6273. Subscription rates are $5.00 for U.S.A. and possessions. All other countries $7.50 per year. Subscriptions may be paid the London office at £2-12s-6d per year. Acceptance under 34.64, P. L. & R., authorized.

DIESEL PROGRESS is indexed regularly by Engineering Index, Inc.

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FRONT COVER ILLUSTRATION

The *Anahita V*, 82-ft yacht built by Pendship at their Holland, Michigan yards from designs by M. Rosenblatt & Son for Alfred Epstein of Grosse Point, Michigan. Four GM 3-cycle diesels give her a speed of 18 knots. *Photo by Morris Rosenfeld, New York City.*

# THE HEAT'S OFF THE HIAWATHA!

Westward towards the Rockies speeds the Hiawatha, the Milwaukee Route's crack Diesel streamliner! It's a hot, grueling, cross-country run, but Harrison heavy-duty lube oil and jacket water coolers are on the job . . . keeping the engines cool. Harrison coolers are rugged, reliable, compact . . . designed specifically to cool the newest Diesel engines. In fact, a majority of the Diesel locomotives on the road today are Harrison-cooled. If you have a cooling problem, look to Harrison for the answer!

**HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.**

*HARRISON*

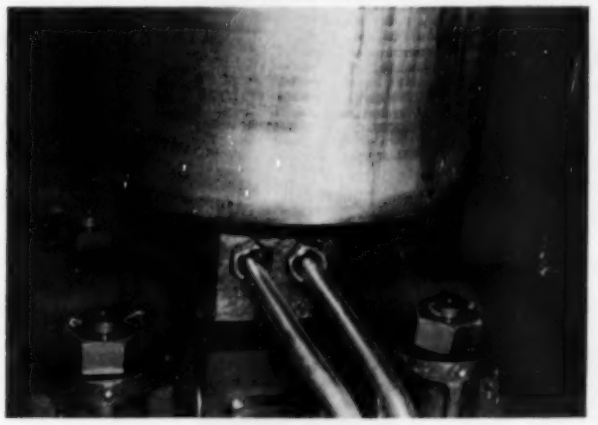
TEMPERATURES MADE TO ORDER

# The Engineer's Report

CASE HISTORY
RPM Delo Marine
PRODUCT Lubricating Oil
Pacific Far East Lines, Inc.,
FIRM San Francisco

## New lubricating oil cuts costs on motorships!

RPM DELO Marine Lubricating Oil, a new detergent-type oil, lubricates the big Sun-Doxford diesel propulsion engines in Pacific Far East Line's M.V. Sea Serpent. Especially developed for cylinder and bearing lubrication in high-output, low-speed marine diesels, this special oil minimizes the problem of deposit formation in engines. It keeps them cleaner even where the heavier residual fuels are used. Special compounding in RPM DELO Marine Lubricating Oil inhibits engine deposits, helps keep lacquer off cylinder liners and reduces wear. Records from actual operations show that this oil can cut maintenance costs on big diesels up to 30% and greatly reduce oil consumption. RPM DELO Marine Lubricating Oil is available in viscosity grades SAE 30, 40 and 50.



AVAILABLE IN MANY PORTS. RPM DELO Marine Lubricating Oil is stocked for ship operators in all principal ports throughout the nation.

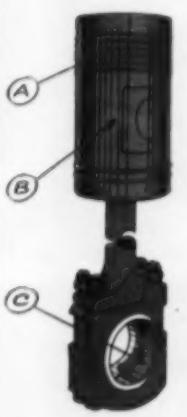
Standard Marine Fuel and Lubricant Engineers are stationed in the following ports: Seattle, Portland, San Francisco, Oakland, and Los Angeles Harbor area. They will give ship operators expert help at any time.

FOR MORE INFORMATION about RPM DELO Marine Lubricating Oil or other petroleum products, or the name of your nearest distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OIL

TRADEMARKS "RPM DELO" REG. U.S. PAT. OFF.

### How RPM DELO Marine Lubricating Oil keeps engines clean and prevents wear




A. Highly effective compounding inhibits deposits...solves residual fuel carbon problems in low-speed marine diesels ...cleans dirty engines, keeps new engines clean, helps prevent scuffing.

B. Special anti-oxidant additive resists formation of lacquer and prevents ring-sticking. Film stays on parts whether hot or cold, running or idle.

C. Corrosion and foam inhibitors stop bearing corrosion, prevent foaming in wet or dry sump engines.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

# NOW SHOWING

## "How E-M Generators Became a Friend To Thousands of Kansans Out at Great Bend"

**OR**

## "Good Light, Sweetheart"

### A DRAMA IN ONE INSTALLATION

**Setting:** Headquarters and the recently expanded power plant of Central Kansas Electric Cooperative, Inc.*, Great Bend, Kansas.

**Time:** The present.

**Produced by:** (the new electric power, that is) Two E-M Synchronous Generators, 4250 kva, 2400/4160 volts, 257 rpm, driven by diesel engines.

**Directed by:** A. C. Kirkwood & Associates, consulting engineers, Kansas City, Mo.

**Leading Men:** The management and staff of Central Kansas Electric Cooperative, Inc.

**Villains:** None.

### CAST OF CHARACTERS

**Customers of CKECI*:** Home Owner, Farmer, City Official, Factory Manager, Telephone Man

**CKECI* Official** **E-M Engineer** (offstage)

### CURTAIN RISES



**Home Owner:**

I need light, and I don't want flicker;
I want steady power or I may be a kicker.
My radio, washer, range and TV
Have got to run smooth or it'll bother me.



**Farmer:**

The power I use is vital to me—
I can't run my farm without electricity.
I want reliable voltage day after day.
And I'll blow my top if it fades away.



**City Official:**

What we like about the plant out at Great Bend
Is this: We get *dependable* power to expend.
Street lighting, for example, must
always go on.
And taxpayers *count* on this phenomenon!



**Factory Manager:**

Quality and quantity of power are of
prime concern.
They can affect the amount of profits we earn.
We're happy to say, as customers of Great Bend,
That quality and quantity are what they send.



**Telephone Man:**

In days of old, when power plants
were smaller,
We used to hear our customers holler.
Power line confusion made me out a bad actor—
Not any more, here's low "TIF" factor!



**CKECI* Official:**

These new E-M Generators serve our
customers well,
And before they even started, we could tell . . .
They were inspected, tested and checked to
make it;
When they went on the line we knew they
could take it!

**E-M Engineer** (offstage):

Amen!

You power users can put your minds at ease—
E-M Generators help solve needs like these.
In modern plants like the one at Great Bend,
Our units produce power on which you
can depend!



E-M's air gap is exact, and always remember,
It's perfect whether January, June or December.
Special winding, welded rings, and coil-end
tightening
Resist urges and surges from switching
and lightning.



E-M's cast rotor spider, in parallel operation,
Puts 'em smooth on the line in this
modern station.
And our brazed damper cage has earned
many a rave
For assisting a steady, uniform voltage wave.



Telephone users who fear the "TIF" factor
Will find an E-M Generator a really
*good* actor!
Core slots are "skewed" with strict adherence
To lowest possible 'phone interference!

**CURTAIN**

**Moral:**

When you plan your next Generator, take advantage of E-M's experience and the extra values built into E-M equipment. Ask your nearest E-M sales engineer for facts, and write the factory for E-M Publication No. 196, "Your Guide to Profitable Installations of Modern Generators".

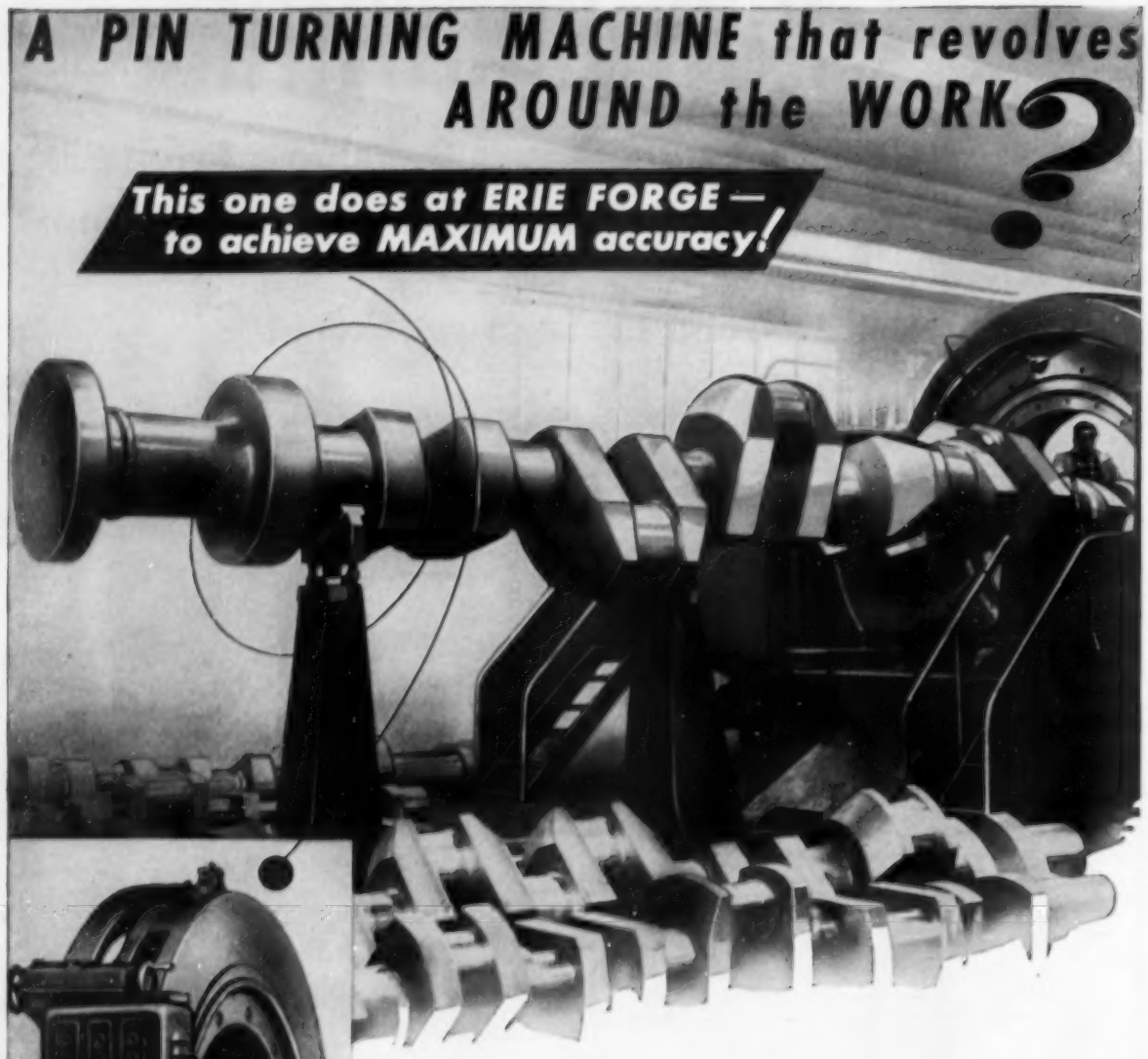
**ELECTRIC MACHINERY MFG. COMPANY**
**Minneapolis 13, Minnesota**

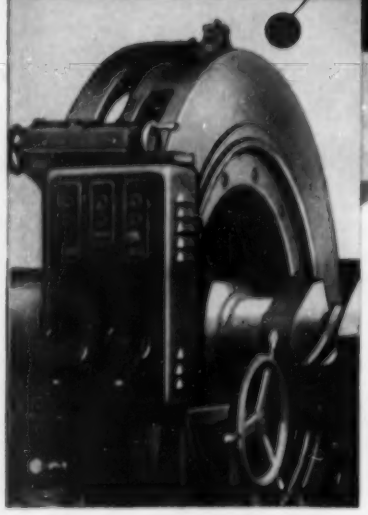
**...SPECIALISTS IN E-M *Custom Built* GENERATORS**

2200-TPA-2164

# A PIN TURNING MACHINE that revolves AROUND the WORK?

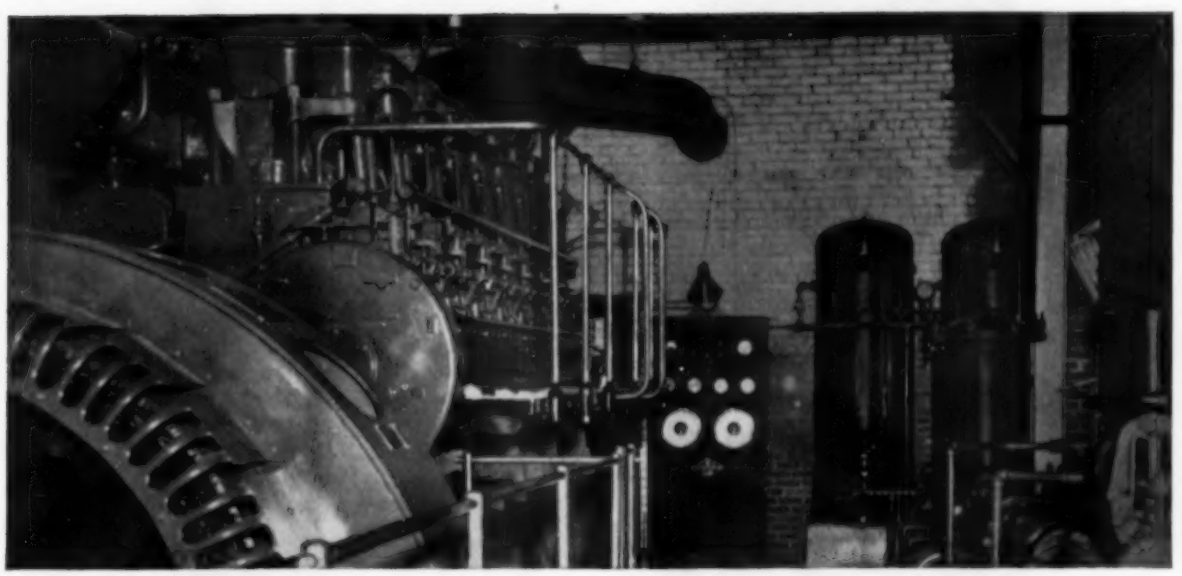
**This one does at ERIE FORGE— to achieve MAXIMUM accuracy!**





AT ERIE FORGE & STEEL CORPORATION you'll find the most accurate pin turning machine in the country. The crankshaft is held motionless . . . the machine revolves around the work! The crankshaft is accurately aligned, then bolted down . . . it cannot move off center! As this 50,000 pound crankshaft is automatically moved, from throw to throw, through the machine opening, it is finish turned to close tolerances and a mirror finish. This exceptional degree of accuracy is standard practice at Erie Forge & Steel Corporation. Every operation—from ingot to finished crankshaft—is under one control, one responsibility. Consult with us on your next requirements involving crankshafts, connecting rods or allied items.

**ERIE FORGE & STEEL CORPORATION**
**ERIE, PENNSYLVANIA**

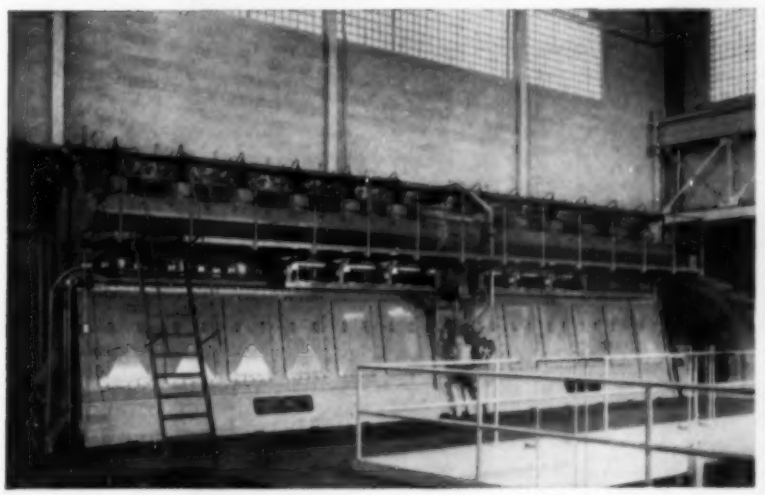


**BALDWIN**

**600 SERIES**

12¾ x 15½ turbocharged diesels with 6 or 8 cylinders. Develop 620 to 1750 hp at 514 to 625 rpm.

**QUAKERTOWN, PA.**, switched to diesel power generation with this 1560 hp Baldwin and saved three ways . . . (1) Initial cost was appreciably less than alternative boiler and turbine. (2) Medium speed (600 rpm) Baldwin is very economical in use of fuel and lube oil. Total operating costs, including amortization, are 60% less than purchased power. (3) Ready availability of the Baldwin for standby service has cut weekend operating costs 25%.



**HAMILTON**

**21½ x 27½**

diesel and dual fuel engines. Available in 5 to 12 cylinders with a net horsepower range from 2350 to 5450.

***WRITE*** for more facts about these B-L-H diesels that are your most economical and dependable power generating source in the 500 to 20,000 kw range.

**DECATUR, IND. (Heavy Fuel)** This 3810 kw Hamilton 21½ x 27½ engine operates 18 to 20 hours daily burning heaviest residuals with an *absolutely invisible exhaust*. There's been no unusual piston ring or liner wear. Decatur's fuel cost is just 4.6 mills per kwh.

**ROBSTOWN, TEX. (Dual Fuel)** This 2050 kw Hamilton 21½ x 27½ engine has been performing efficiently on dual fuel since 1952. Equally high efficiency is reported for two newer, 9 cylinder, Hamilton dual fuel engines like this at Great Bend, Kansas.

**BALDWIN-LIMA-HAMILTON**

**Hamilton Division, Hamilton, Ohio**

## *"...business helps itself by promoting thrift among its own people."*

**EDWARD C. BALTZ**
*President*
*Perpetual Building Association*
*Washington, D. C.*

***"Expanding the regular sales of U. S. Savings Bonds is essential to the continued success of our Government's sound money policy. Savings Bonds help people build security for themselves and stability for the nation's economy. A reserve in Bonds gives them the assurance to spend current income on homes, cars and other substantial purchases. Meanwhile, regular Bond buying goes on adding to their future buying power. Thus business helps itself by promoting thrift among its own people. The surest way to encourage an employee to save regularly right where he works is to sign him up on the Payroll Savings Plan."***

Let's point up this statement by Mr. Baltz, head of one of the nation's outstanding thrift institutions and volunteer chairman of the District of Columbia Savings Bond Committee, with a few facts and figures:

- currently, more than 45,000 companies, large and small, representing every classification of industry and business, are encouraging national thrift through the Payroll Savings Plan.
- every month, 8,500,000 Payroll Savers in these 45,000 companies invest more than $160,000,000 in Savings Bonds.
- largely as the result of employer-encouraged thrift the cash value of Savings Bonds held by individuals on July 31, 1954, totaled more than 37.5 billion dollars.
- never before has America had such a reserve of future purchasing power.
- invested in America, these 37.5 billion dollars in Savings Bonds Dollars are a most effective check on inflation and a very important contribution to economic stability and a sound dollar.

A million new Payroll Savers by the end of 1954! That's the goal of those who believe that what is good for Americans is good for business. To do your part in reaching this objective, phone, wire or write today to Savings Bonds Division, U. S. Treasury Department, Washington, D. C. Your State Director, U. S. Treasury Department, will show you how easy it is to build a successful Payroll Savings Plan.

*The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

Robert H. Hadrian

**Editor—DIESEL PROGRESS**

# DAVIE PICKS
# GM Power
## *for their first Diesel Tug*

QUEBEC's Davie Shipbuilding Ltd. had a harbor-full of good reasons for specifying General Motors Diesel power in the CHARLIE S. Low operating costs. High availability. Low maintenance. They're the same reasons why most leading tugboat owners specify GM Diesel power when they order new tugs.

The CHARLIE S was built in record time—six weeks from keel-laying to launching. And this modern tug is out to set performance records in the busy Port of Quebec. It joins a fleet of three steam tugs owned and operated by Davie Shipbuilding but will do more work because it can run longer without stopping to refuel, add boiler water or be serviced.

Profit-making tug owners know it pays to specify General Motors Diesel power when they order new tugs—or repower old ones. Your local Cleveland Diesel Engine Division representative can show you why—can show you how you can cut your water transportation costs with GM Diesel power. Call or write him today for more information.

*General Motors Diesel-powered tugboat, CHARLIE S, built and operated by Davie Shipbuilding Ltd., Quebec, Canada.*

**CLEVELAND DIESEL ENGINE DIVISION**

GENERAL MOTORS • CLEVELAND 11, OHIO • *ENGINES FROM 150 TO 3300 H.P.*

CLEVELAND DIESEL

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# ELECTRIC POWER

## DELCO-REMY ThunderVolt A.C. GENERATORS HEAVY-DUTY (180-Ampere Output Capacity)

Delco-Remy ThunderVolt A.C. generators are the hearts of 12-volt A.C.-D.C. electrical systems designed specifically for modern Diesel buses with fluorescent lighting and extra-heavy electrical loads.

Desirable performance characteristics include cut-in at low generator rpm . . . maximum output of 180 amperes at approximately 2000 rpm. The new generators supply not only alternating current for fluorescent lights but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

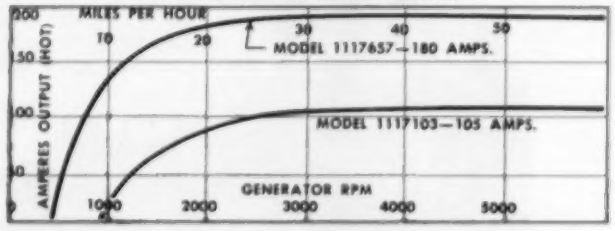
Impressive features of the new generators are their light weight, very high output capacity, and ability to operate over a wide speed range with greatest efficiency. Specify Delco-Remy electrical equipment on your new buses.

A.C. GENERATOR PERFORMANCE DATA

| Model | Volts | Cut-In RPM* | Curb Idle Amperes* | Maximum Amperes | Power Watts | Recommended For |
|---|---|---|---|---|---|---|
| 1117103 | 12 | 975 | 6 | 105 | 1260 | All speeds. |
| 1117657 | 12 | 625 | 100 | 180 | 2160 | All speeds. |
| 1117062-3-4 | 6 | 750 | 30-40 | 90 | 540 | All speeds. |

*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

A.C. GENERATOR OUTPUT CURVES




## DELCO-REMY ThunderVolt D.C. SPLIT-FIELD GENERATOR HEAVY-DUTY (120-Ampere Output Capacity)

The Delco-Remy 12-volt split-field generator and its companion regulator are rugged and dependable—designed to meet the needs of Diesel transit buses having increased electrical loads coupled with a high percentage of engine idling time.

Desirable performance characteristics include low cut-in, high output at engine idle, and quick attainment of maximum output. Note performance table at right.

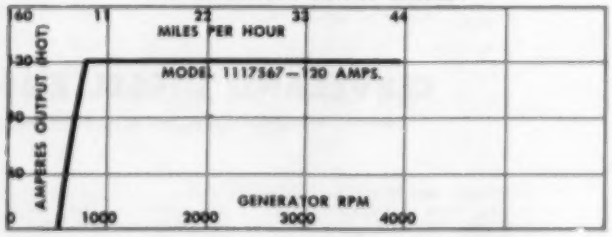
Operating benefits include reduced battery cycling, long battery life, and a simplified electrical system with sustained voltage—at no sacrifice in ruggedness or dependability.

D.C. GENERATOR PERFORMANCE DATA

| Model | Volts | Cut-In RPM* | Curb Idle Amperes* | Maximum Amperes | Power Watts | Recommended For |
|---|---|---|---|---|---|---|
| 1117567 | 12 | 550 | 70 | 120 | 1440 | Low speed & idling. |

*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

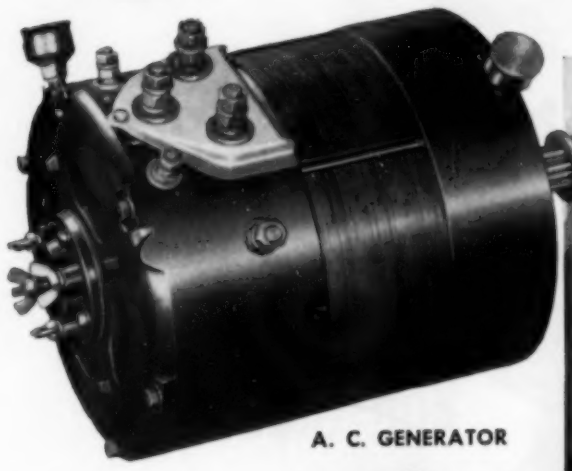
D.C. GENERATOR OUTPUT CURVES




Delco-Remy
ThunderVolt
ELECTRICAL SYSTEMS

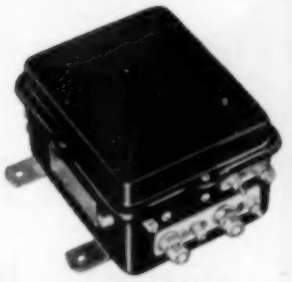
DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

# right for the job

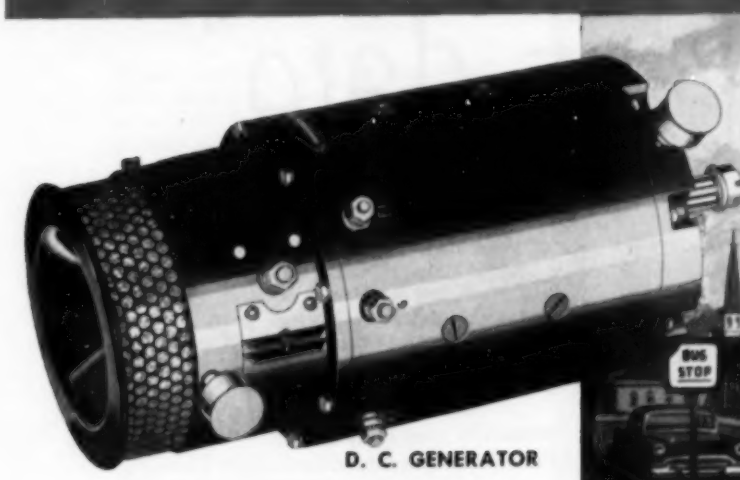


A. C. GENERATOR

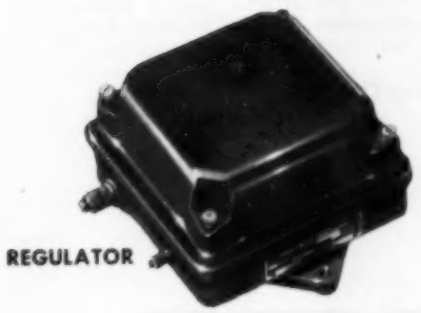
RECTIFIER



REGULATOR



D. C. GENERATOR



REGULATOR

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W H E R E V E R  W H E E L S  T U R N  O R  P R O P E L L E R S  S P I N

**FAMOUS LAST WORDS:**

# "they wouldn't dare"

That's what they said the day before Pearl Harbor. Remember? But by now you'd think people would have learned. Let's face it—we must be ready for disaster at any moment. It may be an atom bomb—or it may be a fire, a flood, a hurricane. It's only common sense to be prepared for it, whatever it is. Take these precautions TODAY:

- ☐ **Enlist the help** of your local Civil Defense Director.
- ☐ **Check contents** and locations of first-aid kits.
- ☐ **Send staff** to Red Cross courses. They may save your life.
- ☐ **Promote preparedness** in your community. Your local CD Director can show you how.

***Set the standard of preparedness in your plant city—check off these four simple points NOW.***

SPACE FOR THIS **CIVIL DEFENSE** MESSAGE CONTRIBUTED BY

R. H. Macy

# Mechanic and Helper* remove Piston in Record Time

20,000 people at the New York Boat Show tried to guess how long it would take to pull a piston on a standard production model Opposed Piston Diesel.

Starting from scratch, the piston was removed and on the floor—in just two minutes flat!

Why was it possible in just two minutes? There are no gasketed joints to separate—no lube or fuel oil connections to break—no water connections to break—no cylinder heads to remove. That's why, in two minutes, you can do on an O-P what it takes hours—even days—to do on comparable diesel engines.

There's more—much more—to the story of what Repowering with O-P can mean to your maintenance operations and profit. Why not get together with your nearby F-M Marine Specialist and find out about the profitable difference with O-P Power? Fairbanks, Morse & Co., Chicago 5, Illinois.

*TV Actress Joan Kemp

**FAIRBANKS-MORSE**

*a name worth remembering when you want the best*

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

## 1955 AED OFFICERS TAKE OVER

Officers elected at the recent 56th Annual Meeting of Associated Equipment Distributors in Chicago. Standing, left to right: F. J. Fitzpatrick, Parker-Danner Co., Hyde Park, Mass., treasurer; H. D. Anderson, Rish Equipment Co., Bluefield, W. Va., vice president; M. F. MacDonald, F. H. Hopkins Co., Ltd., Montreal, Quebec, vice president; P. D. Hermann, Associated Equipment Distributors, executive secretary. Seated, left to right: L. Miner Doolen, Telford Equipment Co., Lansing, Mich., vice president; Ray J. Finn, Bode-Finn Co., Cincinnati, Ohio, president; and S. F. Laskey, Northwestern Equipment Inc., Fargo, N. D., executive vice president.

Mr. Finn, the newly elected AED president entered his present business in 1934 when he joined Albert H. Bode to form the Bode-Finn Company, merging two 80-year-old firms. In 1938 John H. Harrod became a member of the firm and Bode-Finn became a construction equipment distributor. The new AED president has served the national association in many capacities. He was executive vice president in 1954 and before that was vice president for two terms. He also served two terms on AED's board of directors and has held various important committee chairmanships.

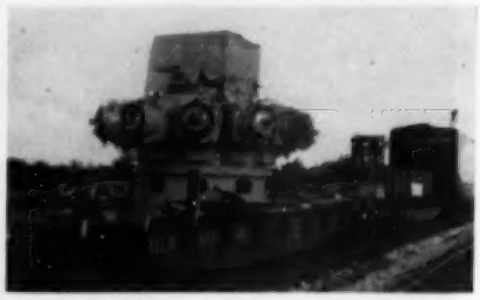
---

## FLORIDA FLOOD CONTROL

Three Nordberg radial diesels are to be installed in the pump station S-9 now under construction on the South New River Canal, southwest of Fort Lauderdale, Florida. The pump station structure is being constructed under the supervision of A. L. Hamilton of the Ivy H. Smith Construction Co. of Jacksonville, Florida.

The three Nordberg pumps will be of the vertical type and will have propellers measuring 122 inches in diameter and a section bell diameter of 204 inches. Each will be driven by a 1625 hp radial type Nordberg diesel engine. Each pumping unit will discharge 432,000 gallons of water a minute at a rated head of 10.3 feet.

This pumping station known as No. S-9 along with No. 13 will serve the Davie agricultural area of approximately 105 square miles lying west of the city of Fort Lauderdale, Florida. This area is devoted mostly to citrus groves and the raising of beef cattle.



Design and construction of the entire Central and Southern Florida Flood Control Project is under the direction of the Jacksonville, Florida District of the Corps of Engineers, U. S. Army.

**One of 3 diesel engines built by Nordberg Manufacturing Co. for use in the Central and South Florida Flood Control Project is hauled by flatcar from Milwaukee, Wisconsin, to Ft. Lauderdale, Florida. The huge diesels will be used to operate the pumps at pump station S9, now under construction on the South New River Canal, southwest of Ft. Lauderdale, by the Corps of Engineers, U. S. Army.**

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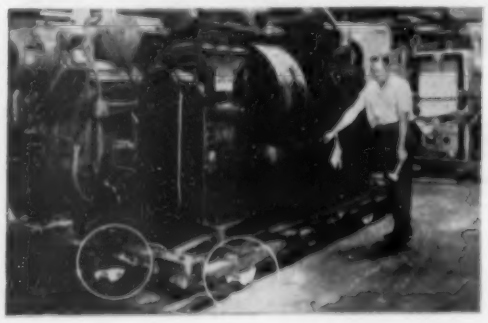
## MOVING HEAVY MACHINERY

Stokvis-Edera & Co., Inc., has placed on the market a new, ingenious device known as the "Multiton" roller skid which may well replace the standard tools of the heavy moving trade, roller bars and pry bars. The development of "Multiton" roller skids was the direct result of Stokvis-Edera's main business, the sale and installation of metal working machinery of various kinds. The Engineering Department was given the task of developing a unit that would cut down on this "down time" for skilled set-up personnel. The requirements were that the dolly be extremely powerful yet light so that it could be placed as needed, when needed, and could be easily carried. The specifications also included that the dolly be not of the axle type, which would result in single point wheel contact with the floor.



**An eight-ton internal grinder is being moved on four Multiton roller skids. Two of the rollers circled.**

**Close-up of a Multiton roller skid showing turntable with gripping "teeth."**

"Multiton" roller skids are designed specifically for inordinate weights. The turntable is furnished with gripping "teeth" that imbed themselves into the wooden frame underneath the load, as the load is placed onto two or more "Multiton" units. When power is applied to the load, the "Multiton" units move forward, laying the rollers ahead of them, as on a tractor or military tank. Applications of the "Multiton" roller skids have included their use in the temporary manufacture of overhead cranes, where the "Multiton" units take the place of wheels supporting cranes along their runways. Literature on the "Multiton" Roller Skid is available by writing File 120, DIESEL PROGRESS, Cole Station, Los Angeles 46, California.

## NEW DIESEL-ELECTRIC LOCOMOTIVE

A new four-unit diesel-electric road locomotive has been produced by the General Electric Company and placed in operation to evaluate components used in locomotives for export service. G. W. Wilson, general manager of GE's Locomotive and Car Equipment Department, identified it as a 6,000-horsepower locomotive. It has been placed in freight service on the Erie Railroad for trial purposes. Running normal freight schedules, its operation over an extended period will simulate as many export-type applications as possible. To achieve this end, two of the four units are powered by eight-cylinder, V-type Cooper-Bessemer turbo-supercharged diesel engines. These four-cycle power plants develop 1,200-horsepower each for traction at 1,000 rpm.

The other two units are powered by 12-cylinder engines of the same make that develop 1,800-horsepower each. The four units have a total weight of 490 tons and an over-all length of 212 feet. All units are equipped with GE-752 standard heavy-duty diesel-electric locomotive traction motors to permit testing under heavy American railroad operating conditions. Provision is made for full dynamic braking. Static excitation and the latest G-E design control components are employed. The locomotive was built by General Electric to provide a means of accurately observing the performance of various standard components and of testing new standard devices in actual operation, with the aim of further improving apparatus and locomotive design and performance.

## NEW ORLEANS WINS F-M SALES COMPETITION

The New Orleans Branch of Fairbanks, Morse & Co. received the silver trophy for top sales performance in 1954 in the sales contest conducted annually by this Chicago manufacturer of diesel engines, locomotives, scales, pumps and electric machinery. The Colonel Robert H. Morse Cup, as the silver trophy is called, was presented by Colonel Morse himself, chairman of the board, to P. S. Procter, manager of the Fairbanks-Morse New Orleans branch at a special dinner given at the Roosevelt Hotel, New Orleans. A gain of more than 20 percent over the previous year's sales in the New Orleans area was reported by Robert H. Morse, Jr., president. Pointing out that last year it was the Atlanta, Georgia, branch that won the trophy, Mr. Morse suggested that awards for top sales performance over the last two years to two Southern branches indicate the trend of our nation's industry and business progress in the South.

**Among the Fairbanks, Morse & Company executives present at the Colonel Morse Cup Presentations for top sales in 1954 were: Left to right, front row: Page S. Procter, manager New Orleans branch; Colonel Robert H. Morse, chairman of the board; Robert H. Morse, Jr., president; R. B. Craig, vice president. In the rear, left to right: O. S. Leslie, vice president Manufacturing; W. B. Morse, Jr., manager Detroit branch; J. A. Cuneo, vice president—Sales; R. H. Morse, III, assistant to the vice president—Sales; R. D. Brown, assistant to the secretary; O. L. Bryant, honor salesman-New Orleans branch; Henry J. Barbour, manager Sales Promotion and Public Relations.**

The Cup has been awarded to twelve of the company's sixteen branches in the twenty-two years since Colonel Morse made the first award (called the President's Cup) to the branch house enjoying the largest volume of sales in relation to its annual quota. This is the first time the Cup was won by the New Orleans branch. O. L. Bryant, top salesman of the year for the New Orleans Branch, had his name inscribed on the Cup alongside that of manager Procter's.

Three generations of the Morse family attended the presentation of the 1954 Colonel Robert H. Morse Cup. They were: Colonel Robert H. Morse, chairman of the board; Robert H. Morse, Jr., president; Robert H. Morse III, assistant to vice-president—Sales; and W. B. Morse, Detroit, Michigan, branch manager. Other Fairbanks-Morse executives and officers who attended were: J. A. Cuneo, vice-president—Sales; O. S. Leslie, vice-president—Manufacturing; R. B. Craig, vice-president; Henry J. Barbour, manager, Sales Promotion and Public Relations; R. D. Brown, assistant to the secretary; John S. King, Cincinnati branch manager; W. B. Wylly, Atlanta branch manager; H. D. Gobble, Dallas branch manager; Alf. M. McLaren, St. Louis branch manager; O. O. Lewis, former vice-president and director of the company now living in Miami; and Arthur L. Decker, vice-president, The Buchen Company, advertising counselors.

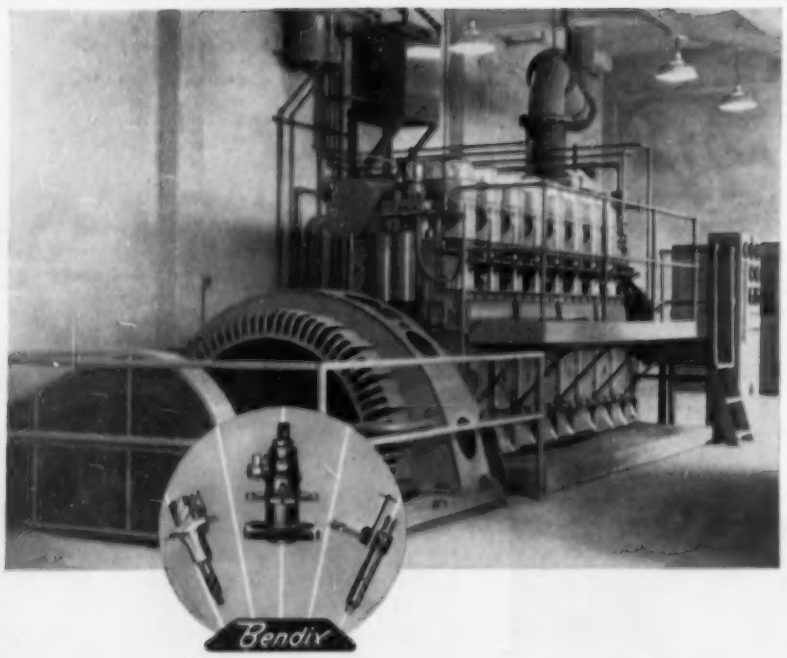
## LOG HAULER

The Model TD Euclid Log Hauler, on operations of T. Enemark Logging Company, Ltd., near Port Mellon, British Columbia, was recently introduced to the Northwest logging industry by Euclid Division, General Motors Corp. Loads averaging more than 20,000 board feet are hauled over difficult roads a distance of approximately 7 miles, with a savings of 15 minutes on both the loaded haul and return trip. Features of the "Euc" Model TD Log Hauler include 300 hp GM diesel engine, Allison Torqmatic drive, No-Spin differential, power steering, 18:00x25 tires on drive axle. The rated capacity is 120,000 pounds with 14 foot bunks and 50 ton trailers.

Keeping San Francisco's new International
Airport ready for any power emergency . . .
SAN FRANCISCO INTERNATIONAL AIRPORT

## ENTERPRISE 1000 KW DIESEL GENERATOR WITH

# Bendix FUEL INJECTION EQUIPMENT!




Providing emergency lighting facilities for the vast, new San Francisco International Airport is no small task. Add to this the job of powering pumps connected to the field's drainage system, in case of floods, and you have still another chore that takes on herculean proportions. Yet, the Enterprise Diesel Generator with Bendix* Fuel Injection Equipment, set for standby duty at this modern new airport, is prepared to handle either of these functions!

As you can appreciate, specifications met by Enterprise Engineers in making this installation were rigid. In addition to assuming full load within 15 minutes after starting, it was required that the Bendix equipped power plant provide continuous full load operation for weeks or even months without "shutdown." In all tests prior to acceptance by city officials, this mighty standby generator not only met, but actually surpassed, these rugged requirements!

Here, once again, is proof that when operating conditions demand unfailing dependability, Bendix Fuel Injection Equipment is the choice of leading diesel engine manufacturers.

*REG. U.S. PAT. OFF.

SCINTILLA DIVISION

Bendix AVIATION CORPORATION

YOU TOO CAN USE HEAVY FUEL

# BENSON, MINNESOTA REA

This modern power plant at Benson, Minn., owned and operated by the Western Minnesota Power Cooperative, is one of the nation's most efficient internal combustion engine plants. At right can be seen the two Pritchard cooling towers and the fuel processing house.

## Five Cooper-Bessemer Diesels at Benson, Minn. Use Residual Fuel With Full Success; Low Oil Price Outweighs Equipment and Handling Costs

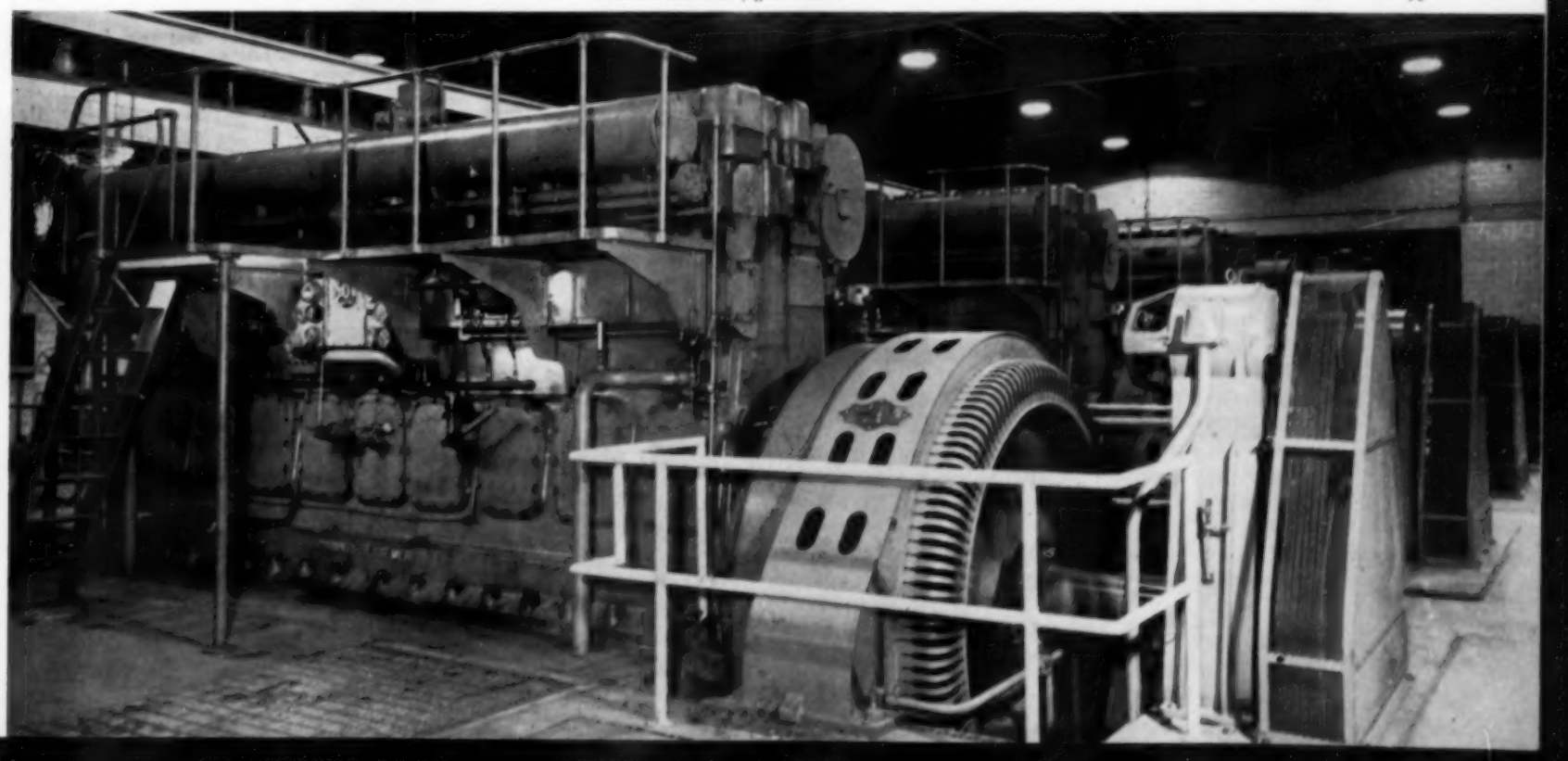
*By* WILLIAM H. GOTTLIEB

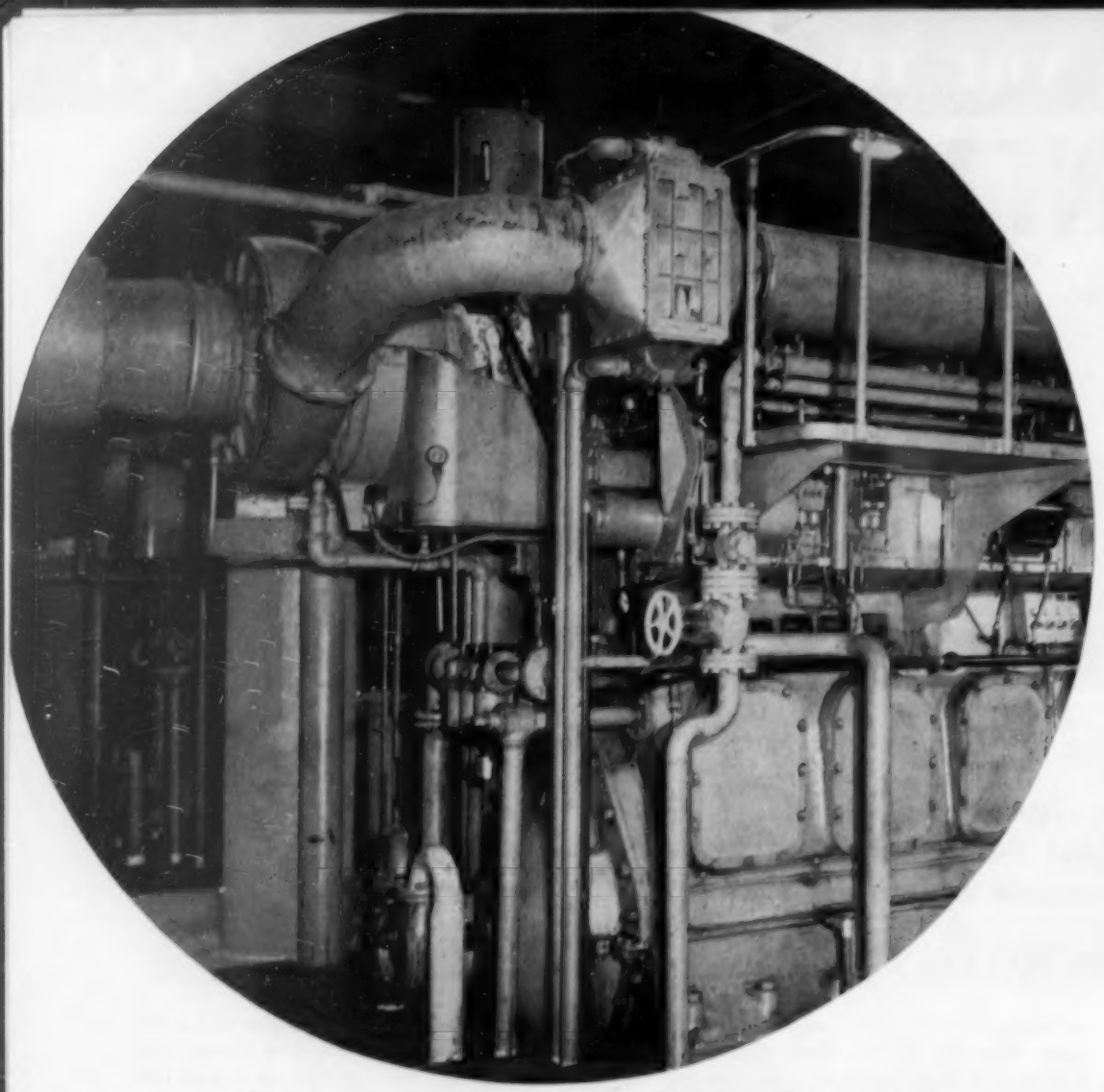
ONE of the nation's notable REA plants has demonstrated that it is possible to run diesels successfully on No. 6 residual fuel oil. By "successfully" we mean with no increased engine wear, no adverse effect on lubricating oil, but with important savings in fuel costs. In its first year with residual oil, the plant effected a net saving of $29,769.03. We'll break that down and show exactly how the job was done.

The plant that has achieved these results is owned and operated by Agra Lite Cooperative at Benson, Minn. Here, five 1850 hp turbocharged Cooper-Bessemer diesels are producing more than 18,000,000 kw/hrs a year to supply the cooperative's 4025 consumers over 2300 miles of distribution line. The plant at Benson is strategically located to supply its broad consumer area in western Minnesota. Unfortunately, it is also an area where fuel costs are high. No natural gas is available to the plant and the delivered price of fuel oil is high and keeps getting higher. Prior to 1954, the plant used a 23-25 API gravity crude oil for engine fuel, a very satisfactory fuel except for the price. Average price per gallon during the year 1953 was a shade over 11 cents and the upward trend was continuing. In this situation, Agra Lite Manager Victor Hanson felt it imperative to investigate the possibility of using cheaper fuel. He conferred with his consulting engineer, H. S. Bliss of General Engineering Corp. and with Cooper-Bessemer, whose fuel engineer, Edw. B. Rawlins, has given close study to the use of residual oils.

The plant at Benson houses five supercharged Cooper-Bessemer diesels, each rated at 1850 hp at 327 rpm. All the engines use a No. 6 residual fuel oil. Each diesel drives a 1305 kw Electric Machinery generator.







This view of the five Cooper-Bessemer diesels shows the Young Radiator aftercoolers and the exhaust-driven turbochargers—Elliott on the original three engines, Cooper-Bessemer on the two newer units shown above.

The decision was made to switch the diesels at Benson to a diet of No. 6 fuel which could be obtained for about $.075 per gallon. A fuel-handling system was designed and the necessary equipment installed in 1953 and substantial use of the residual oil began in January 1954. From February on, the No. 6 was the basic fuel for the plant, with the lighter crude used primarily in starting and stopping the engines. Thus, the operating figures for the years 1953 and 1954 provide a meaningful comparison of power production with crude and residual fuels. In the year 1953, the five diesels produced 15,314,200 net kw/hrs while consuming 1,083,810 gal. of crude oil at a total cost of $119,516.29. In 1954, the five Cooper-Bessemers generated 17,212,000 net kw/hrs on 1,024,469 gal. of residual oil and 204,941 gal. of crude with a combined cost of $99,774.96. To appraise the savings effected with residual oil, we must consider realistically the possible alternative in 1954, the use of crude oil at the 1954 average price of $.1158 a gallon. If the full 1,229,410 gallons of fuel consumed in the year had been purchased at this price, total cost would have been $142,367.68. Compared with the actual fuel cost of $99,774.96, this means a gross saving of $42,592.72 through use of residual fuel during the year 1954.

Unfortunately, that is not the whole story. Successful use of No. 6 oil requires work and equipment in order to deliver to the engine injection systems a clean fuel at proper viscosity for atomization.

Mr. Hanson reports that the capital investment in building, equipment, piping and engine alterations was $64,249.65. An additional $18,739.26 was spent for a new 260,000-gal. fuel storage tank with related piping and equipment, bringing total investment to $82,988.91. Amortizing this investment and calculating all additional carrying charges and operating expenses, Mr. Hanson lists the following 1954 costs attributable to the heavy fuel:

| | |
|---|---|
| Taxes | $ 1,328.00 |
| Interest | 1,660.00 |
| Extra Labor | 3,200.00 |
| Depreciation | 2,490.00 |
| Boiler fuel (residual) | 1,995.69 |
| Power and light (est.) | 1,400.00 |
| Maintainence (est.) | 750.00 |
| Total | $ 12,823.69 |

Subtracting these added fixed charges and operating costs from the gross saving in fuel costs, we get a clear net saving of $29,769.03 through use of residual fuel in 1954. Actually, we have stated the case conservatively. After all, this was the Benson plant's first year on No. 6. Mr. Hanson has this to say: "While we are pleased to have made as large a saving as we did in 1954, we feel that this first year of operation with No. 6 residual fuel has, to a large extent, been a year of experimentation.

That is true both in the actual application of the fuel in operating the engines, as well as in the purchasing of the residual fuel. We know we will be able to reduce the percentage of 'light' fuel used (which was rather large in 1954), and we believe that as we gain experience in purchasing residuals, we will be able to buy them to better advantage than we were able to do in 1954. We therefore look forward to attaining substantial improvements over the first year's results."

But what about the effects of residual fuel on the engines? Again, let us quote Mr. Hanson: "Our engines are operating very satisfactorily on the heavy fuel. There is no evidence of increased wear, or faster deterioration of lubricating oil." He does point out, however, that the higher fuel temperatures necessitate closer attention to the engine fuel injection systems to maintain them at a high level of efficiency. It is the practice to clean valves, fuel pumps and nozzles every 1500 engine hours.

Serving one of the five diesels are these two filters: A Honan-Crane (left) on heavy fuel and a Nugent on lubricating oil, bypassing lube from the engine's pressure system.

For each engine there is a Ross heat exchanger on the cooling water system and a Ross lube oil cooler. Temperatures are controlled by Powers thermostatic valves.

With this care, there has been very little trouble and the nozzles are as clean as they were with the lighter fuel. The detergent lube oil is maintained in good condition with multiple filtration for each engine. Some oil from the engine's pressure lubricating system is by-passed through a waste-packed filter while a motor-driven pump takes oil from the sump, puts it through a cellulose-packed filter and back to the sump. Engine wear is slight.

The words "heavy fuel" have different connotations for different diesel operators. Some would describe the Benson plant's 23 gravity crude as "heavy" but only because they have not worked with a No. 6 residual oil. This reporter inspected a bucketful of the fuel used at Benson on a moderately cool day and found it so thick it could best be handled with a shovel. Actually, the fuels designated as residual vary widely and, in this low price bracket, Mr. Hanson buys the best he can get. Here are the specifications of what he considers the best and the worst No. 6 fuels he has purchased.

THE BEST OIL

| | |
|---|---|
| API Gravity | 16.1 |
| Viscosity @ 122°f, ssf | 175 sec. |
| Flash | 250° |
| B.S. & W. | 0.2% |
| Sulphur | 0.97% |

THE WORST OIL

| | |
|---|---|
| API Gravity | 7.0 |
| Viscosity @ 122°f, ssf | 330 sec. maximum |
| Pour Point | 45°f |
| Flash | 150° minimum |
| B.S. & W. | Under 2% |
| Sulphur | Under 1% |
| Conradson carbon | 15 to 18% |

The problem in handling such oil is first to heat it sufficiently to pump, filter and centrifuge it, second, to remove impurities. Primary source of heat at the Agra Lite plant is a steam boiler (which burns No. 6 oil) rated at 1380 lbs/hr at 150 psig.

**TABLE I**

| 1953 | Gross Kw Hr Generated | Gal. Fuel Consumption | Kwh. Per Gal. | Gals. Lube | Hp Hr per Gal. Lube | Engine Hrs. |
|---|---|---|---|---|---|---|
| Jan. | 1,489,000 | 99,330 | 15.09 | 1,800 | 255 | 13,058 |
| Feb. | 1,325,200 | 89,033 | 14.82 | 1,659 | 312 | 9,837 |
| Mar. | 1,442,400 | 97,748 | 14.71 | 1,878 | 310 | 11,207 |
| Apr. | 1,447,000 | 97,622 | 14.82 | 1,881 | 290 | 11,999 |
| May. | 1,339,400 | 90,801 | 14.75 | 1,748 | 235 | 13,760 |
| Jun. | 1,182,800 | 82,326 | 14.37 | 1,614 | 205 | 14,565 |
| July. | 1,173,800 | 80,770 | 14.53 | 1,461 | 168 | 15,714 |
| Aug. | 1,219,000 | 83,710 | 14.56 | 1,519 | 205 | 13,455 |
| Sep. | 1,163,700 | 78,594 | 14.81 | 1,461 | 159 | 16,999 |
| Oct. | 1,260,500 | 85,042 | 14.82 | 1,549 | 188 | 15,242 |
| Nov. | 1,328,900 | 89,511 | 14.85 | 1,632 | 187 | 16,145 |
| Dec. | 1,609,700 | 109,323 | 14.72 | 1,992 | 225 | 16,379 |
| Totals | 15,981,400 | 1,083,810 | 14.74 | 20,194 | 2,739 | 13,639 |

**TABLE II**

| 1954 | Gross Kw Hr Generated | Engine Fuel Oil Consumed Residual | Crude | Total | Kwh Per Gal. | Engine Hrs. | Gals. Lube | Hp/Hr per Gal. Lube |
|---|---|---|---|---|---|---|---|---|
| Jan. | 1,800,000 | 53,003 | 60,194 | 113,197 | 15.90 | 2,189 | 259 | 15,636 |
| Feb. | 1,431,200 | 82,942 | 12,830 | 95,772 | 14.94 | 1,847 | 240 | 14,237 |
| Mar. | 1,723,700 | 105,849 | 11,870 | 117,719 | 14.64 | 2,156 | 318 | 12,542 |
| Apr. | 1,638,900 | 90,862 | 20,787 | 111,649 | 14.68 | 2,038 | 307 | 12,281 |
| May. | 1,561,300 | 95,620 | 8,780 | 104,400 | 14.95 | 1,969 | 351 | 10,378 |
| June | 1,306,500 | 83,001 | 6,980 | 89,981 | 14.52 | 1,776 | 319 | 10,300 |
| July | 1,324,500 | 86,192 | 6,290 | 92,482 | 14.32 | 1,741 | 300 | 10,736 |
| Aug. | 1,333,900 | 74,683 | 18,140 | 92,823 | 14.37 | 1,695 | 278 | 11,280 |
| Sep. | 1,306,200 | 79,215 | 10,950 | 90,165 | 14.49 | 1,681 | 214 | 14,532 |
| Oct. | 1,425,300 | 85,519 | 13,460 | 98,978 | 14.40 | 1,838 | 256 | 13,282 |
| Nov. | 1,497,200 | 88,675 | 14,580 | 103,255 | 14.50 | 1,906 | 272 | 12,963 |
| Dec. | 1,716,000 | 98,908 | 20,080 | 118,988 | 14.42 | 2,290 | 350 | 12,104 |
| Totals | 18,064,700 | 1,024,469 | 204,941 | 1,229,410 | 14.69 | 23,126 | 3,464 | 12,322 |

The Great Northern Railroad runs past the plant and steam is piped underground to a siding to heat tank cars to 130-140°f. for unloading. A pair of motor-driven pumps in the fuel processing house unload the oil and bring it to the house where it is heated by steam in a heat exchanger and then sent to storage. There are five 25,000-gal. horizontal storage tanks of which three are used for residual and two for crude oil. The new 260,000-gal. vertical tank stores residual fuel. This large capacity makes it possible to purchase stocks of fuel during summer months when prices are lower and oil is easier to handle. As needed, oil is pumped from storage through steam heat exchangers to a pair of centrifuges at a temperature of 200 to 210°f. The centrifuges have been called on to take out as much as 11 lbs. of solids from 500 gal. of oil, though this batch must be classified as unusually dirty. From the centrifuges, the oil flows by gravity to a 1000-gal. engine supply tank which is buried in a pit and thoroughly insulated. Another pair of motor-driven transfer pumps take fuel from the supply tank, put it through another heat exchanger where temperature is raised to 265°f, then through a

**The Cooperative's manager is shown here with the power plant operating staff: Left to right are: Clifford Gandrud, operator; Oscar Helgeson, operator; Harlan Helgeson, helper; Victor Hanson, manager; Tom Ulstad, assistant chief; Arthur Helgeson, chief; Kenneth Williams, operator. Another operator, Henry Goll is not shown.**



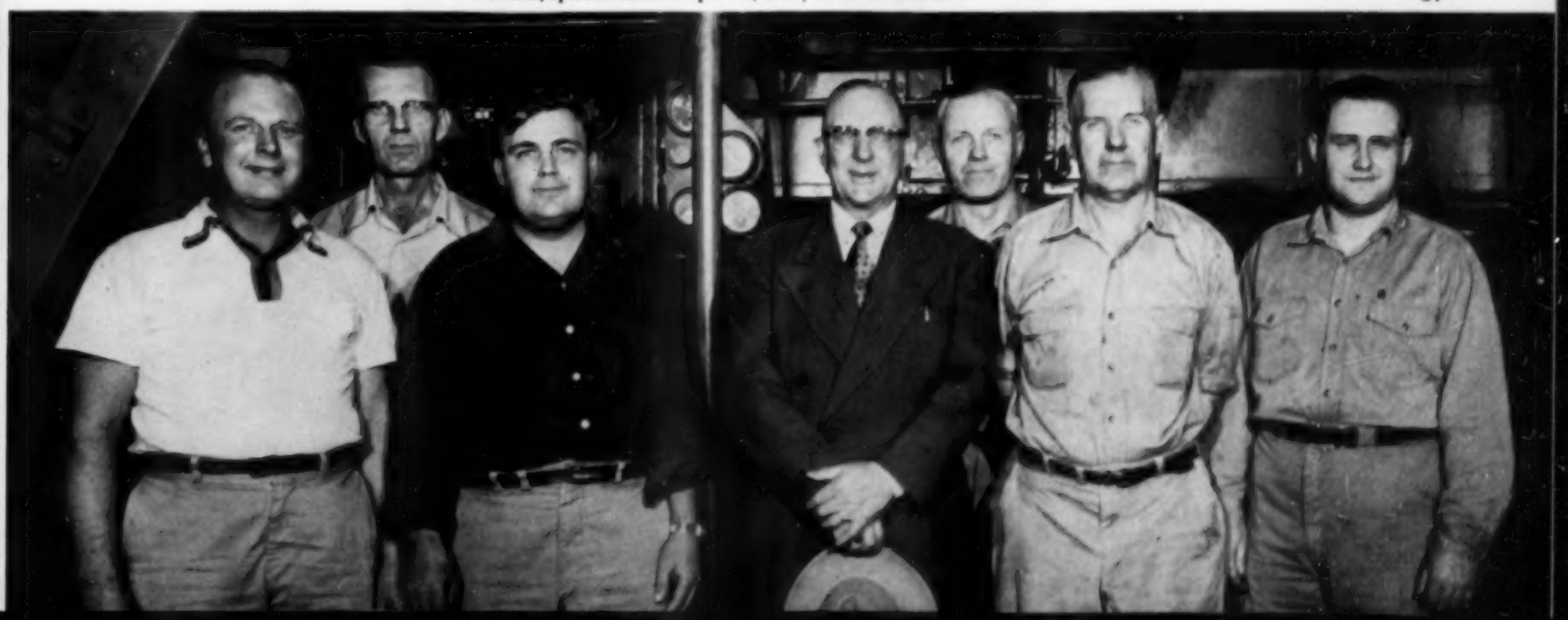


**TABLE III**

| Cost of Net Energy Generated | 1953 15,314,200 Net Kw/Hrs Total Dollars | Mills Per Net Kw/Hr. | 1954 17,212,000 Net Kw/Hrs Total Dollars | Mills Per Net Kw/Hr. |
|---|---|---|---|---|
| Operation, Supervision, Engineering | 1,731.12 | | 1,701.37 | |
| Station Labor | 19,942.41 | 1.31 | 27,133.69 | 1.58 |
| Fuel Oil | 119,516.29 | 7.82 | 99,774.96 | 5.80 |
| Lubricating Oil | 1,664.15 | .11 | 2,588.41 | .15 |
| Other Operating Supplies | 4,433.85 | | 8,574.43 | |
| Maint. Structures & Impr. Labor | 223.53 | | 182.26 | |
| Maint. Structures & Impr. Material | — | | 3.55 | |
| Maint. Fuel Holders & Access. Labor | 94.46 | | 377.83 | |
| Maint. Fuel Holders & Access. Material | 14.35 | | 568.11 | |
| Maint. Generating & Elect. Equip. Labor | 3,178.02 | | 3,985.12 | |
| Maint. Generating & Elect. Equip. Material | 2,804.94 | | 3,958.96 | |
| Maint. Station Expense— | — | | 1,186.50 | |
| Total Production Expense | 153,603.12 | 10.05 | 150,035.19 | 8.72 |
| OVERHEAD COSTS | | | | |
| Depreciation | 29,457.65 | | 31,081.18 | |
| Taxes | 19,087.65 | | 17,426.13 | |
| Interest | 18,684.93 | | 18,805.52 | |
| Insurance | 1,682.06 | | 1,969.44 | |
| Other Admin. & General | 5,056.44 | | 6,425.59 | |
| Total Overhead Costs | 73,968.73 | 4.84 | 75,707.86 | 4.40 |
| Total Production Cost | 227,571.85 | 14.89 | 225,743.05 | 13.12 |

cellulose-packed filter to the engine supply header which carries fuel to the main plant where it is picked up by individual engine supply pumps. The remainder in the header returns to the supply tank.

Since some heat loss is inevitable in the supply header and it is important to have the oil reach the injection system at full design temperature, each engine is equipped with an automatically-controlled electric heater which raises oil temperature from about 250° at the header to 270°. The oil passes through additional filters and strainers before reaching the high pressure fuel pump that serves the Cooper-Bessemer controlled pressure injection system. A part of the fuel in storage must be kept warm and this is accomplished by pumping continuously through heat exchangers. Three of the diesels send their exhaust gases through waste heat boilers and a portion of this heat is used to warm three of the 25,000 gal. storage tanks. One of the steam heat exchangers in the processing house also is available for this purpose.

Crude oil still has important uses in this system. Engines are started and run on crude oil until engine temperature is up to normal operating level. Also, an engine is run on crude before shutting down in order to flush the residual oil from the system, to cool down pumps and injectors and prevent formation of carbon deposits. When an engine is stopped, warm fuel is circulated through the filters to prevent congealing. The supply of crude to the engines is arranged for operating ease and also serves as a standby in the event of any failure of the residual oil supply. The light fuel is filtered and delivered through a line at 20 psig to a check valve held closed by the 46 psig pressure of the residual oil on the other side. If the flow of residual fuel stops for any reason whatsoever, the crude pushes open the check valve and flows to the fuel pump. The changeover occurs instantaneously and the engine continues to run smoothly.

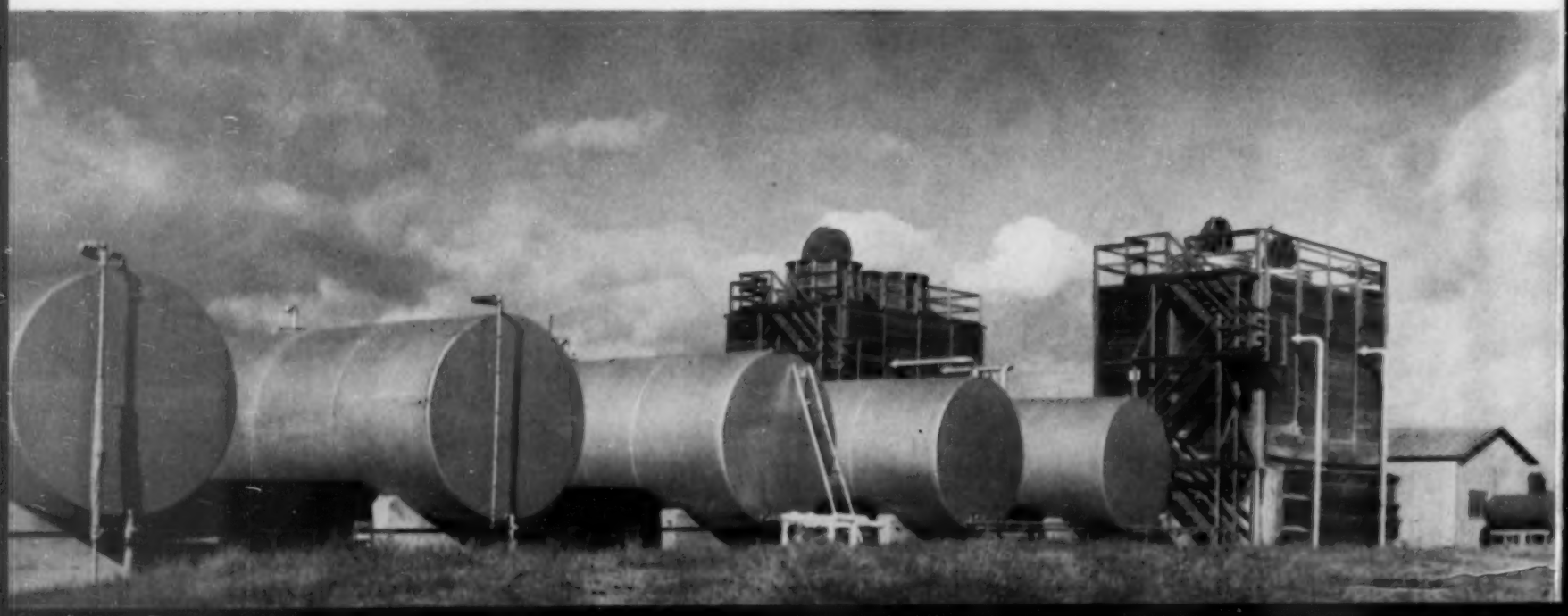
The Benson plant went into operation on Sept. 1, 1948, first element in a projected system to serve member distribution cooperatives of the Western Minnesota Power Cooperative. It developed that changing conditions eliminated the need for additional power stations and the Benson plant always has supplied power exclusively to Agra Lite. In recognition of this situation, ownership of the plant was transferred to Agra Lite on Dec. 31, 1954. As manager of both cooperatives, Victor Hanson continues to direct the operations. The original installations consisted of three LS-8-T supercharged Cooper-Bessemer four-cycle diesels, each rated at 1510 hp at 327 rpm at 110 bmep. In 1950, two new engines of the same size and type were installed. These units, however, were equipped with aftercoolers and operate at 135 bmep giving them a rating of 1850 hp. At the same time, the three original engines were equipped with aftercoolers and raised to 135 bmep. Thus, the plant now has five modern, high-output Cooper-Bessemers with combined capacity of 9250 hp.

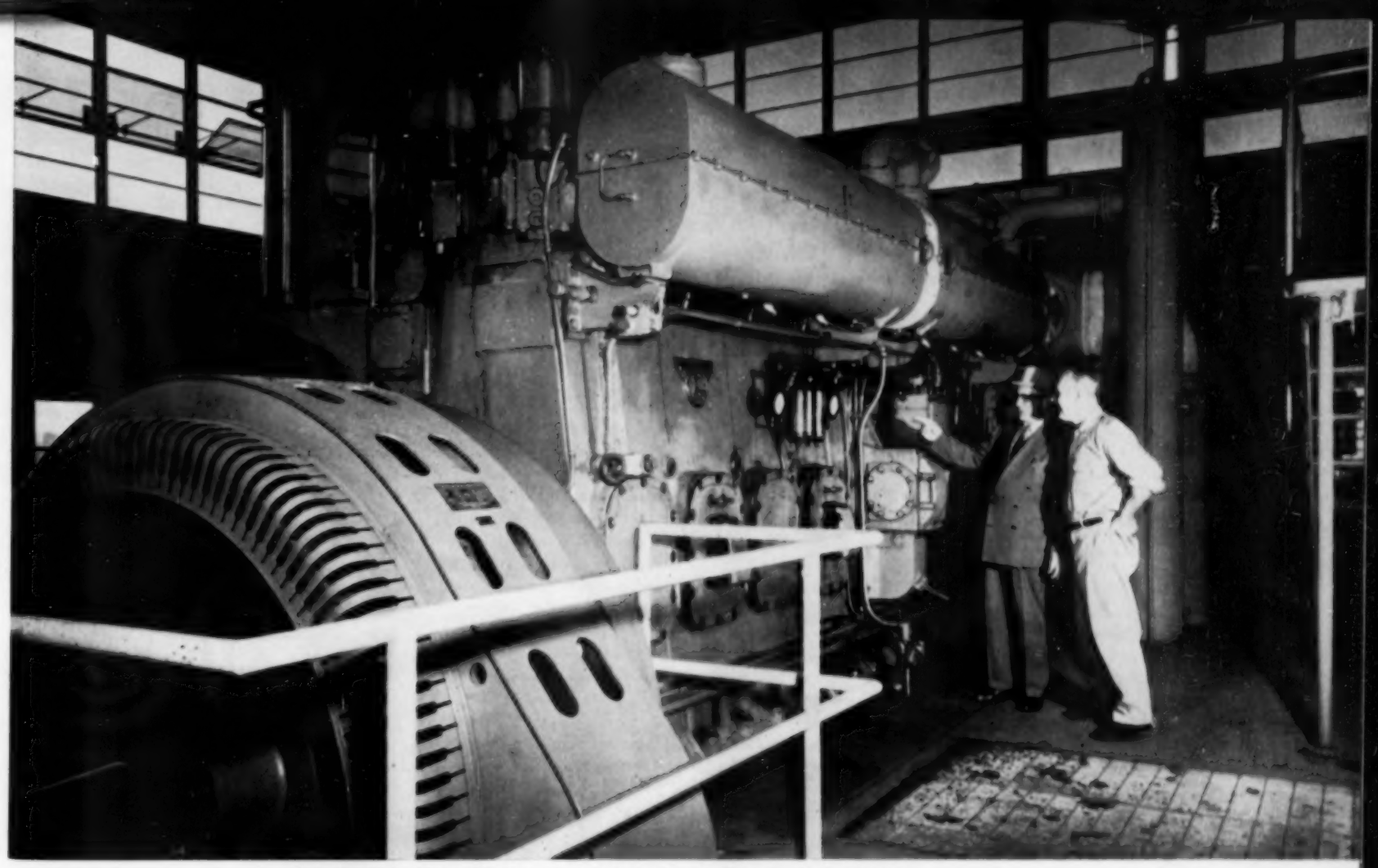
Agra Lite operations are directed by Mr. Hanson with Arthur Helgeson as chief operator, Harold W. Sharpe as general foreman of distribution, Vincent Gallagher as office manager and Dan Lepse and John Engebretson as accountants. The Agra Lite officers and directors are: President Alfred P. Olson, Vice President Peter Erdahl, Secretary-Treasurer Spurgeon Jorgenson and Directors Fred A. Carlson, Leo Kavanagh, Anton Hawge and Telford Olson. Full credit should be given to the service rendered by the officers and directors of Western Minnesota Power Cooperative who directed plant policy up to 1955. They are: President Leroy C. Sabie, Vice President George Voss, Secretary-Treasurer S. Jorgenson, and Directors Lorence Winter, A. W Smith, Charles Swanson and Hugo Parsons.

The men and equipment at Benson have achieved notable things in their first year with residual fuels. Their continued and growing success can serve to guide other plants burdened with the high cost of conventional fuels.



**This REA cooperative buys all the fuel it can at low summer prices and stores it in these five 25,000 gal. tanks and a new 260,000 gal. tank not shown. At right are the two induced draft Pritchard cooling towers and house where residual fuels are handled.**





**This REA plant is notable for its successful use of residual oils for fuel in the Cooper-Bessemer diesels. Discussing the fuel savings are Cooperative Manager Victor Hanson (left) and Chief Operator Arthur Helgeson.**

## List of Equipment

Engines—Five 1850 Hp, 15½x22 in., 8-cylinder, 327 rpm Model LS-8-T supercharged Cooper-Bessemer diesels.

Generators—1450 kva, 1305 kw, 9 pf, 3-ph, 60-cycle, 2400-v synchronous generators. Electric Machinery Mfg. Co.

Governors—Three Pickering, two Woodwards.

Piston rings—Three units use American Hammered; two units use Pedrick.

Air filters—Air Maze.

Turbochargers—Three Elliott, two Cooper-Bessemer.

Aftercoolers—Young Radiator.

Intake silencers—Air Maze.

Exhaust silencers—Maxim, five — including 3 of waste-heat-recovery type.

**Fuel system—on main supply:**

Unloading pumps—Roper on residual; Weinman on crude.

Transfer pumps—Roper.

Level meters—Liquidometer.

Heat exchangers to heat fuel—Kewanee-Ross.

Meters—Buffalo Niagara on residual; Bowser Xacto on crude.

Full flow filter on residual oil—Commercial Filters.

Centrifuges—Sharples.

Purifier on crude—Honan-Crane.

Filter on crude—Commercial Filters.

Fuel System — for each engine:

Electric heater—Chromalox, Wiegand.

Residual oil filters—One 3-element and one 1-element.

Residual oil strainer—Air Maze.

Crude oil filter—One 2-element Purolator.

**Lubricating system:**

Lube oil—Rubilene HD No. 40. Sinclair.

Filters—Hilliard, Nugent and Cuno.

Oil coolers—Kewanee-Ross.

Thermostatic valves—Powers.

**Cooling system:**

Heat exchangers—Kewanee-Ross.

Pumps—Allis-Chalmers.

Cooling towers—Pritchard.

Thermostatic valves—Powers.

Softener—Permutit.

Starting air compressors—Ingersoll-Rand.

Switchboard—Westinghouse.

Voltage regulators—Silverstat Westinghouse.

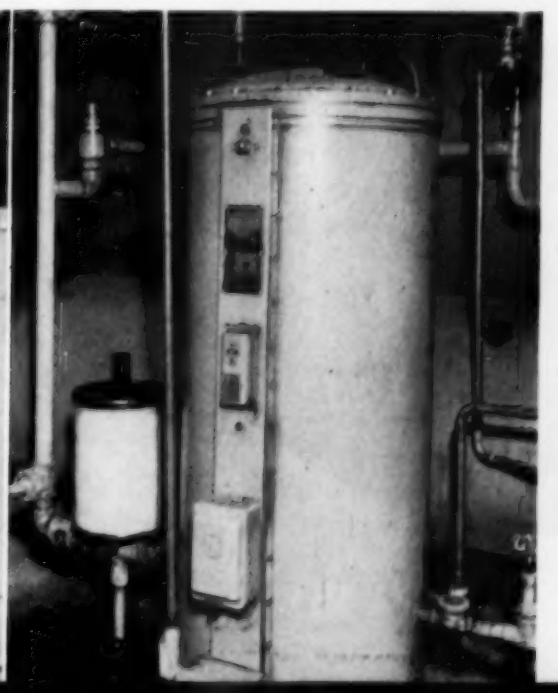
Synchronizer—Allis Chalmers.

Batteries—Exide.

Exhaust Pyrometers—Alnor.

**Each of the five diesels is served by a Hilco Hyflow filter which purifies lubricating oil pumped from the sump tank and then returned to the tank.**

**The crude oil that serves as light fuel in this plant is cleaned in this Honan-Crane oil purifier and also passes through the Commercial filter to the left of the purifier.**



# NORDBERG CENTRIFUGAL GAS COMPRESSOR UNIT

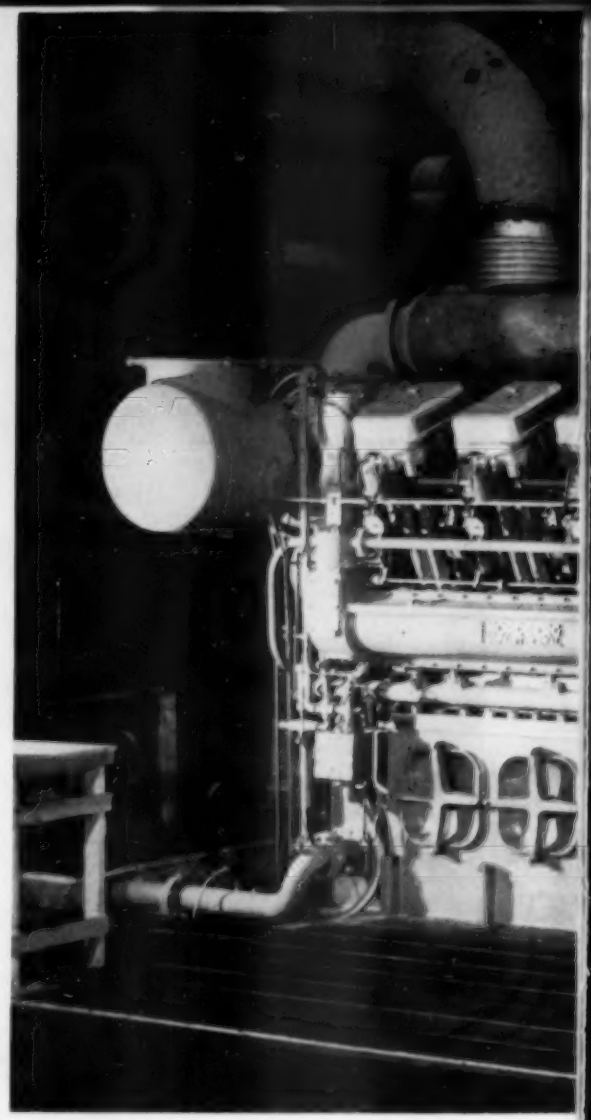
*By* **BRUCE W. WADMAN**

DURING the past 10 years, since the end of World War II, the natural gas industry has gained wide recognition as one of the fastest growing industries in the nation. Although practically all of the country's large population centers now are served by natural gas transmission lines, the long waiting lists of persons and industries desiring additional supplies of gas attest to the fact that the expansion is far from completed.

As gas service has been expanded to include markets farther and farther from producing fields, the need for increased efficiency in transporting gas has been felt more keenly. The rise in field production costs has further contributed to a state of cost consciousness within the gas transmission industry and a search is continuously being made for methods of increasing economy. As a means of cutting costs, much attention has been focused on the selection of compressing equipment. Invariably, fixed costs on the investment in the pipe line represents the largest single factor in the cost of transporting gas. However, this cost is relatively fixed so that any appreciable reduction in costs must be made in the cost of owning and operating compressing equipment.

In the interest of cost reduction, many improvements have been made in compressing equipment: 1. Turbocharging and intercooling four-cycle gas engines. 2. Two-cycle engines have been turbocharged. 3. Engine compression ratios have been increased. 4. Ignition systems have been redesigned to eliminate many former defects. 5. Compressor cylinder efficiencies have been raised and new designs have been introduced to operate over a wider range of conditions.

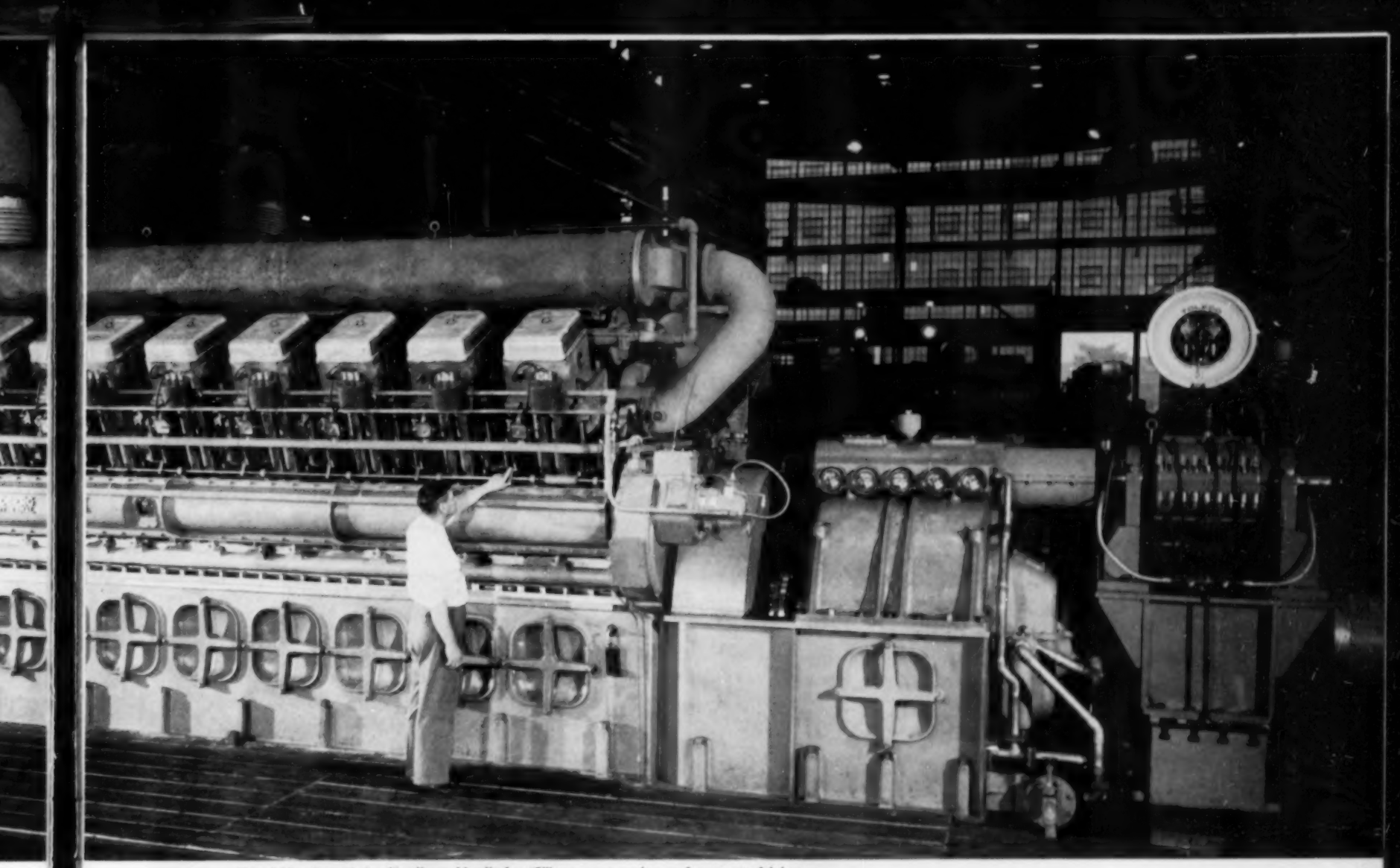
In addition to the improvements in existing types of compressing units, the search for economy and better utilization of facilities led to the development of the centrifugal compressor for gas pipe line service. This type of compressor is particularly well suited to compressing large quantities of gas at low compression ratios. It has been successfully used in conjuction with electric motors, gas turbines, and steam turbines as prime movers. This article deals with another step in the rapid development of better compressing equipment: the application by Nordberg Manufacturing Company of its Supairthermal gas engine driving a centrifugal compressor through a speed increaser gear set.



View of the Nordberg 16-cylinder "V" gas engine on the test stand, showing the DeLaval high pressure turbocharger.

The unit has many advantages—high thermal efficiency, compactness, flexibility of operation, adaptability to remote or automatic controls, and relatively low installed cost. The engine discussed and illustrated here is a spark-fired gas engine of the "V" type. It has 16 cylinders, a bore of 13 in. and stroke of 16½ in. This engine is a four-cycle unit and operates on the Supairthermal principle, which permits higher bmep ratings and improved efficiency without increasing temperatures, pressures, or peak bearing loads.

The Supairthermal system employs a high pressure turbocharger, a fin tube type intercooler for cooling the air before it enters the engine manifold, and automatic control of the inlet valve timing to change the net effective engine compression ratio according to load while maintaining a high, constant expansion ratio. The achievement of a high expansion ratio of 12½:1 without detonation and pre-ignition, which would normally occur at 12½:1 compression ratio, results in improved thermal efficiency, which is in excess of 40%, according to Nordberg's engineers.



**Broadside view of the Nordberg 16-cylinder "V"-type, gas engine and gear set driving a dynamometer on a test stand in the Nordberg plant in Milwaukee. The continuous duty rating is 3550 bhp at 500 rpm.**

The inlet valve of the engine closes before the piston reaches bottom dead center. Air inside the cylinder expands from this point to the end of the stroke, so that the pressure at the beginning of the compression stroke is considerably less than the pressure in the inlet manifold. This results in a low net compression ratio (approximately 6:1 with the engine and ratings described here) so that the temperature of the air-fuel mixture at the end of compression is below the detonation limit. Thus, the correct compression ratio can be selected independent of the expansion ratio. With the resulting lower compression temperatures (which in this engine are approximately the same as a naturally aspirated 6:1 compression ratio engine) it is possible to operate with minimum excess air instead of the extremely lean mixture which would otherwise be required. To maintain the air-fuel ratio approximately constant over a range of engine loads, an actuator, controlled by the turbocharging pressure, automatically varies the timing of the inlet valve closing so that less air is admitted to the cylinder at lighter loads.

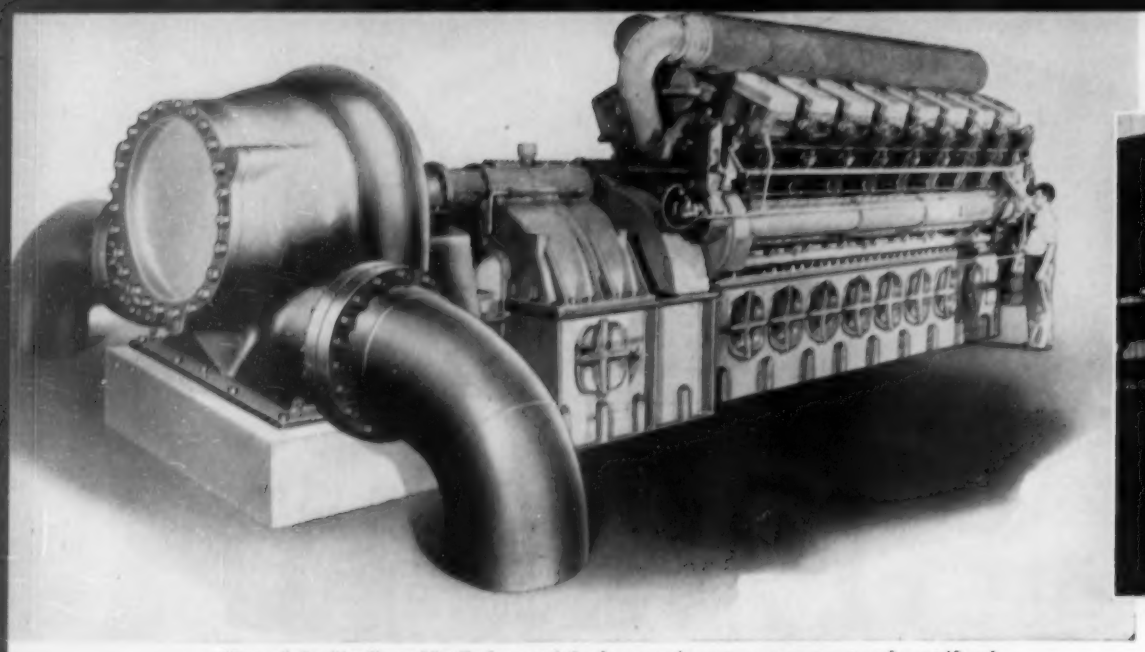
An impulse generator driven from the camshaft provides low voltage, timed alternating current for spark ignition. This current is rectified and the low voltage is then stepped up by transformers which are located near the spark plugs so that the high tension cables are as short as possible. Two spark plugs are provided for each cylinder. It is interesting to note that the combustion chamber and the clearance volume are the same as for the straight diesel version of this engine, and this causes the thermal efficiencies of the spark-fired gas and diesel versions of this engine to be almost the same. The only difference in the combustion chambers is the substitution of spark plugs for the diesel fuel injectors.

The fuel consumption of this 16 cylinder "V" engine illustrates the high thermal efficiencies obtained. A DeLaval high pressure turbocharger capable of 3:1 compression ratio is used on this engine. Continuous duty rating is 3550 bhp at 500 rpm; 160 bmep (at turbocharging pressure of 2.5 atmospheres absolute). Measured fuel consumption—6150 btu/bhp/hr. Emergency rating is 4300 bhp at 550 rpm; 176 bmep (at turbocharging pressure of 3 atmospheres absolute). A 12-cylinder, V-type engine of the same design is also built. The continuous rating of the 12-cylinder unit is 2650 bhp at 500 rpm, according to Nordberg officials.

The engine drives the centrifugal compressor through a Nordberg-built speed increasing gear, which is mounted on the bedplate extension of the engine. A range of gear ratios from 6:1 to 10:1 is available in the built-in gear set without changing gear casings. This feature gives flexibility to the engine-compressor unit and allows for changes in the compressor speed to meet future expansion needs without changing the design speed of the engine. The gear has many design features that contribute to the efficient operation and compactness of the entire unit. The engine and gear set are mounted on one common bedplate, and alignment is determined by dowels.

Because of unitized construction and quill shaft arrangement for driving the gear from the engine, the engine and gear unit is very compact. Quietness of gear operation is brought about by close manufacturing tolerances, the use of a double cone web in the bull gear, and design of the gear casing. The gear casing is made of cast iron, which has good soundproofing qualities. The double cone web brings about uniform stiffness around the rim of the bull gear and also is less subject to resonance and vibration than would be a spoked or flat disc web construction supporting the rim. Rigidity is insured by the use of a heavy casing and a center bearing on the pinion shaft preventing excessive deflection under load. The engine drives the bull gear through a quill shaft in an arrangement similar to many marine installations. The quill shaft is connected to the engine flywheel and bull gear through flexible couplings. The shaft extends through the bore of the bull gear and drives it from the side away from the engine. The use of a quill shaft permits mounting the gear set close to the engine, yet provides torsional flexibility for an adequate operating speed range. The high speed shaft between the pinion and the driven equipment is full floating with a flexible coupling at each end to allow for misalignment. All couplings are of the Fast's gear type.

Conclusions: (1). The highly efficient Supairthermal gas engine affords low operating costs. Because this engine develops twice the horsepower



View of the Nordberg 16-cylinder spark-fired gas engine, step up gear set and centrifugal compressor.

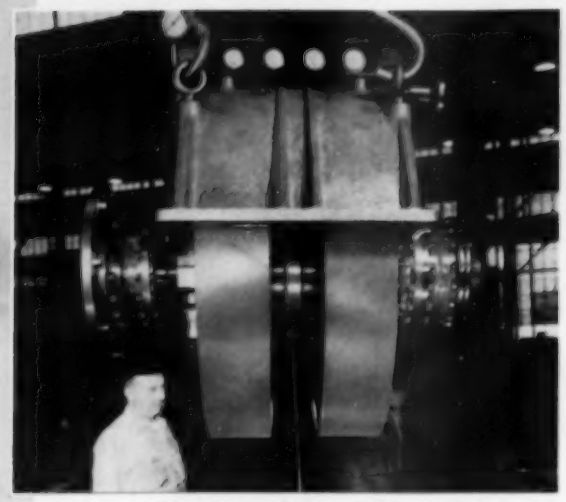


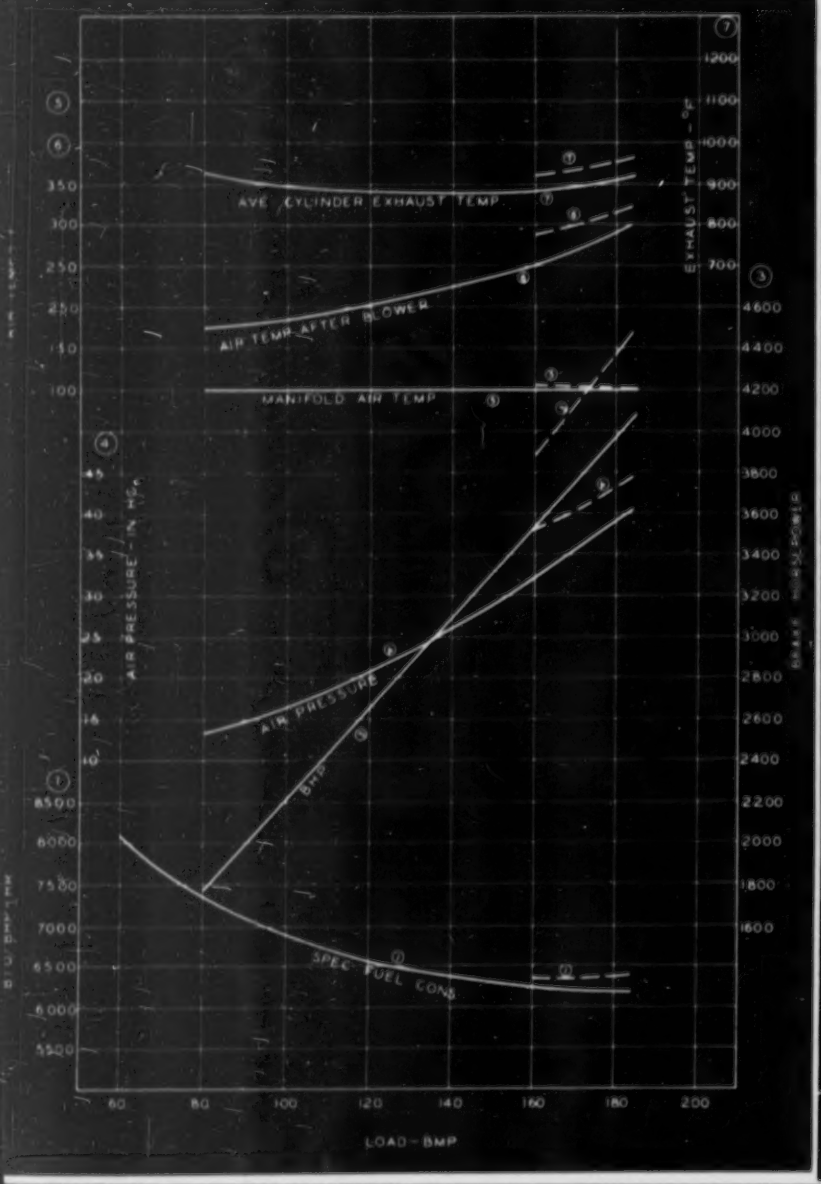
Photo taken in the Nordberg plant showing the speed increasing gear ready for installation on bedplate extension. Cone construction of bull gear web can be seen.

as a naturally aspirated engine of comparable size, the increased horsepower is produced at no increase in lube oil consumption nor in heat load to jacket water. (2). The compactness of the engine and gear design offers low installation costs and small space requirements per horsepower. (3). The wide operating speed range of the engine enables the centrifugal compressor to operate under varying flow conditions. (4). Major expansions in the pipe line system may be achieved by changing gear ratios or by changing the type of impeller in the compressor.

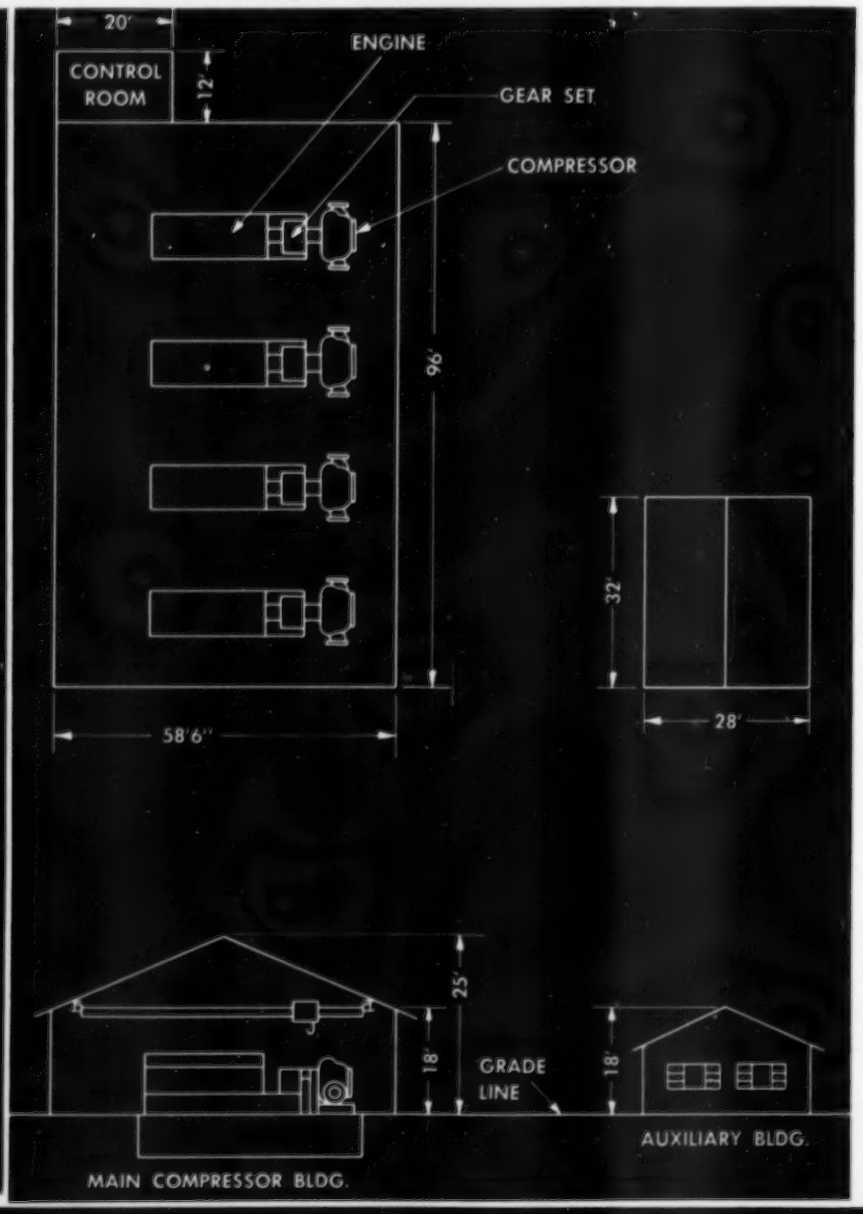
The modern gas-engine centrifugal compressor with its high efficiency compactness, and flexibility promises to be an important factor in the future selection of compressing equipment for gas transmission pipe lines. The first Nordberg engine-centrifugal compressor unit to be installed on a gas pipe line will be driven by a 16 cylinder Supairthermal engine, rated 3000 hp at 470 rpm. The engine will be placed in operation for Transcontinental Gas Pipe Line Corp. in a station about 10 miles out of Houston, Texas. The engine will drive a DeLaval centrifugal compressor through a 10:1 ratio Nordberg speed increaser gear set integral with the engine on an extension of the bedplate.

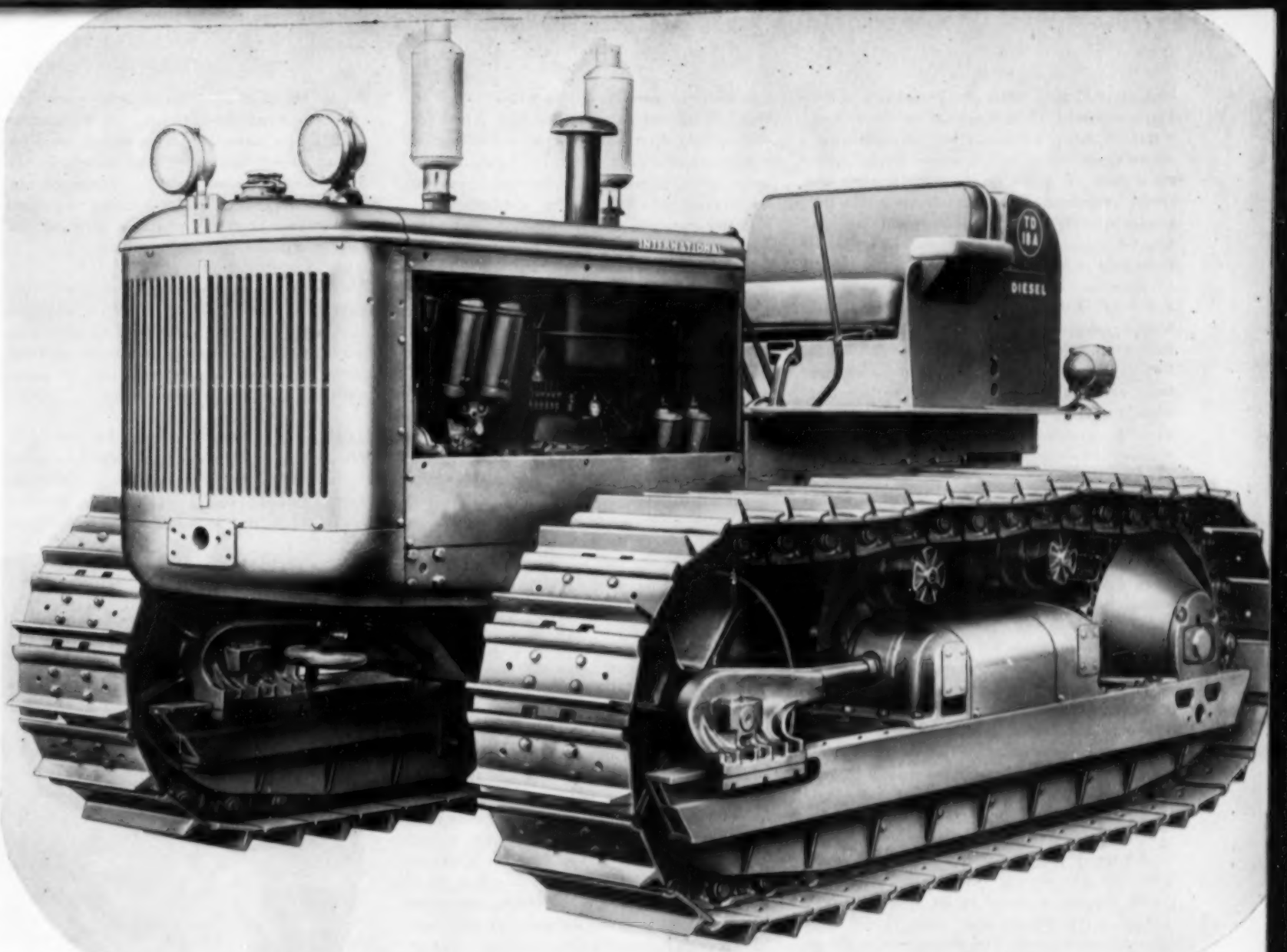


Graph showing the test performance of the Nordberg Supairthermal, spark-fired gas engine, Model FSE-1316-HSC.




Plan and elevation drawing of the Transcontinental Gas Pipe Line Corp. installation outside of Houston, Texas.






# INTERNATIONAL HARVESTER'S NEW TORQUE CONVERTER TRACTOR

*By* BRUCE W. WADMAN

INTERNATIONAL Harvester Company has announced the introduction of a new TD-24 torque converter equipped diesel crawler tractor, which is now in production at their Industrial Power Division plant in Melrose Park, Illinois. The TD-24 is the largest crawler tractor International Harvester builds, and this new torque converter transmission and other improvements, coupled with outstanding features already in standard models that have been included in this new tractor make the big red machine a top-notch performer. A pre-production run of these torque converter tractors have been out in the field for almost a year working in logging operations, strip mining, land clearing, pusher loading, and various earthmoving and highway jobs, and operators have been very high in their praise of its performance, according to International Harvester officials.

The diesel engine in the new tractor has been stepped up from 190 hp at 1400 rpm net at the flywheel, to 200 hp at 1500 rpm net at the flywheel. Other improvements include rotary valves, and keystone section chrome-plated top compression ring on the pistons. The engine is a 4 cycle, 6 cylinder, 5¾-in. bore and 7-in. stroke model, and contains the push button, all weather gasoline conversion starting system feature. It features a new rectangular United Specialties air cleaner 17 per cent larger than previous cleaners. The new air cleaner is mounted on the left side of the engine and provides for more efficient engine performance in severe operating conditions.

The torque converter used is a Twin Disc three stage model with a torque multiplication ratio of 4.9:1. Its hydraulic system is connected to the engine fuel system; since the torque converter must be completely filled with diesel fuel at all times for satisfactory operation, the tractor fuel tank provides replenishing fluid to replace that which is lost through leakage or evaporation. It also receives overflow fluid caused by heat expansion. The torque converter supply pump, which is driven by the engine generator, takes fuel from a tee at the

auxiliary fuel filter outlet and pumps it into the torque converter oil inlet tube at the torque converter oil cooler, which is a heat exchanger connected to the engine cooling system. A relief valve set at 45-60 psi in the supply pump prevents excessive pressure from being built up within the torque converter. Expanded fluid and any entrapped air in the fluid system escapes from the main fluid circuit through an orifice filter extending from the left hand side of the torque converter and flows, together with return fuel from the injection pump, back to the fuel tank. This is the fluid which the supply pump replaces. With this by-pass circulation system, all of the converter fluid periodically passes through the auxiliary fuel filter. The torque converter also features an overrunning clutch as a component. This clutch free wheels at all times except when the turbine or output member of the torque converter revolves faster than the impeller or input member, such as occurs when the load pushes the tractor in descending steep grades or when the tractor is towed or pushed to start the engine. The clutch then automatically engages and effects a direct mechanical connection between the engine and transmission.

Some of the important advantages the torque converter brings to tractor operation are: absorbing of shock loads to the engine and drive components through its fluid action, thus increasing equipment life and decreasing maintenance problems. It automatically matches drawbar pull to the load requirements. It allows a minimum amount of gear shifting and eliminates engine stalling under load.

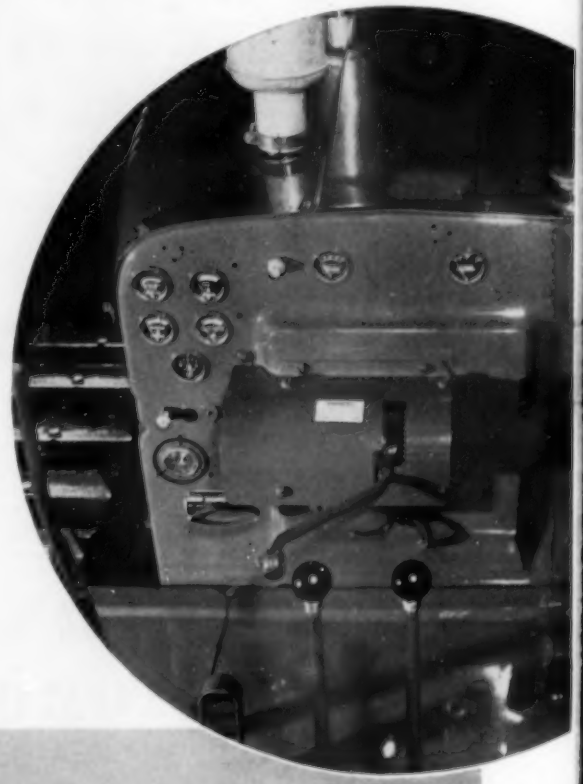
The torque converter is used in conjunction with a two speed gear transmission and a two speed planetary gear steering system. The torque converter impeller is driven by the engine flywheel through a conventional single plate, 17 inch overcenter friction clutch. The transmission is driven by the torque converter turbine through a universal joint which connects the two. The transmission used with the torque converter is a constant mesh type with two speed ratios forward and two in reverse, all selected with one gear shift lever. The engine clutch lever which engages and disengages this transmission has a pull of 15 pounds for maximum operating ease. The planetary gear steering system drive has a high and low speed range position and combined with the constant mesh transmission give the tractor four speeds forward and four speeds in reverse, together with infinite changes of torque which are automatically supplied by the converter to meet variable load conditions. The planetary gear power steering system is a feature that has been carried over from the standard conventional transmission model TD-24, and in conjunction with the torque converter offers a maximum of simplification and exactness of control. The planetary steering system is hydraulically controlled and allows a gear change from high to low or from low to high without interrupting the power train because with the planetary system no clutch is utilized and just moving the control lever instantly changes gear ratios.

This feature makes it easy for the operator to get into the most efficient speed range for the particular job he is performing. Also gradual turns with power on both tracks can be accomplished or feathered or pivot turns with power disconnected from one track with this steering system.

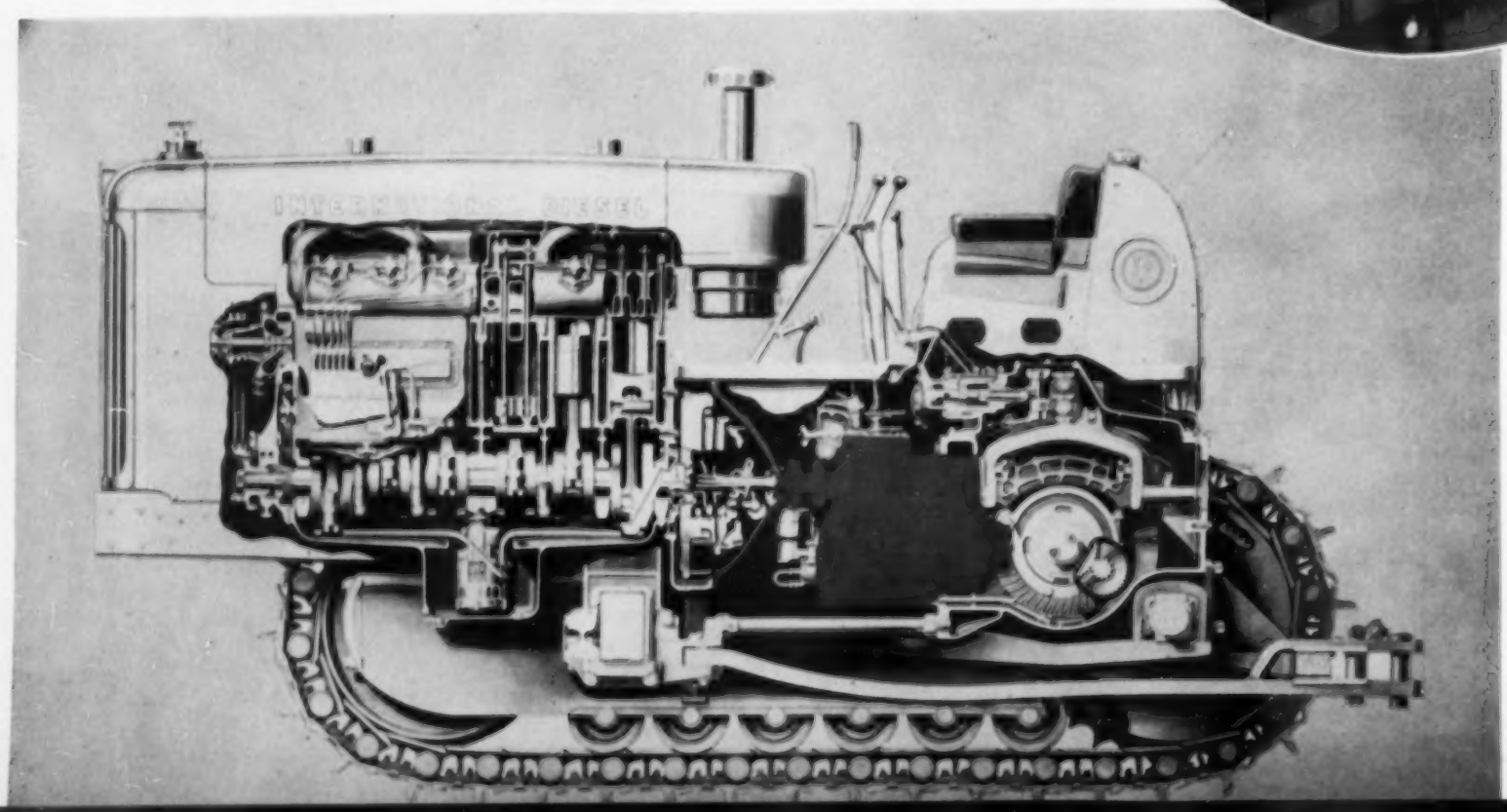
This is important when considering maximum drawbar pull, in turning because to get the maximum drawbar pull, the full weight of the tractor must be utilized, and the only way this can be accomplished in turning is when power is being transmitted to both tracks. There is also a deceleration pedals on the cockpit floor that is operated by the left foot. This pedal operates just the reverse of an automobile accelerator, and allows the operator to control the speed of the tractor closely. This is advantageous, for example, in pushing when the tractor must be eased into position for pushing contact, and when in dozing, a load is being pushed over a cliff or embankment and the tractor speed needs to be closely controlled as the load suddenly lightens. The deceleration pedal is also useful in slowing engine speed for making smooth and quick gear changes in the constant mesh transmission. The transmission control lever is designed so that it is easy to go from high forward range to low reverse range or vice versa in order to speed up operations.

The entire torque converter transmission system gives the advantages of hydraulic drive, wide control range selection, power steering with both tracks pulling, instant high low range planetary gear system shift without breaking the power train, and good tractor speed control.

The torque converter tractor can be used to advantage in many types of jobs. Some illustrations are as follows: In push loading and dozing, the torque converter and planetary steering combination allow the tractor to achieve the highest possi-







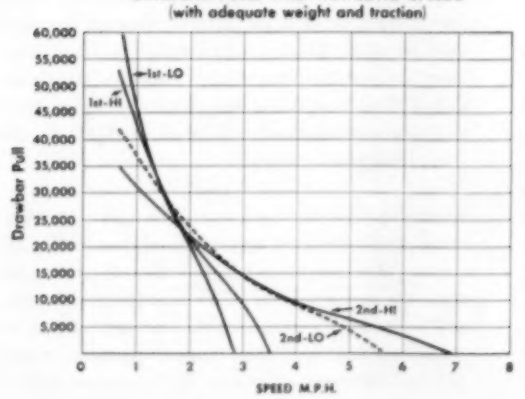
**A TD 24 torque converter unit push-loading one of three Heilines (2T75) on the 4-mile relocation of U. S. Highway 101 on the Pacific shoreline in Oregon.**

**View operator gets from his seat. From left to right: engine clutch lever, decelerator pedal, planetary gear steering system control levers, mechanical foot brake, and transmission control lever.**

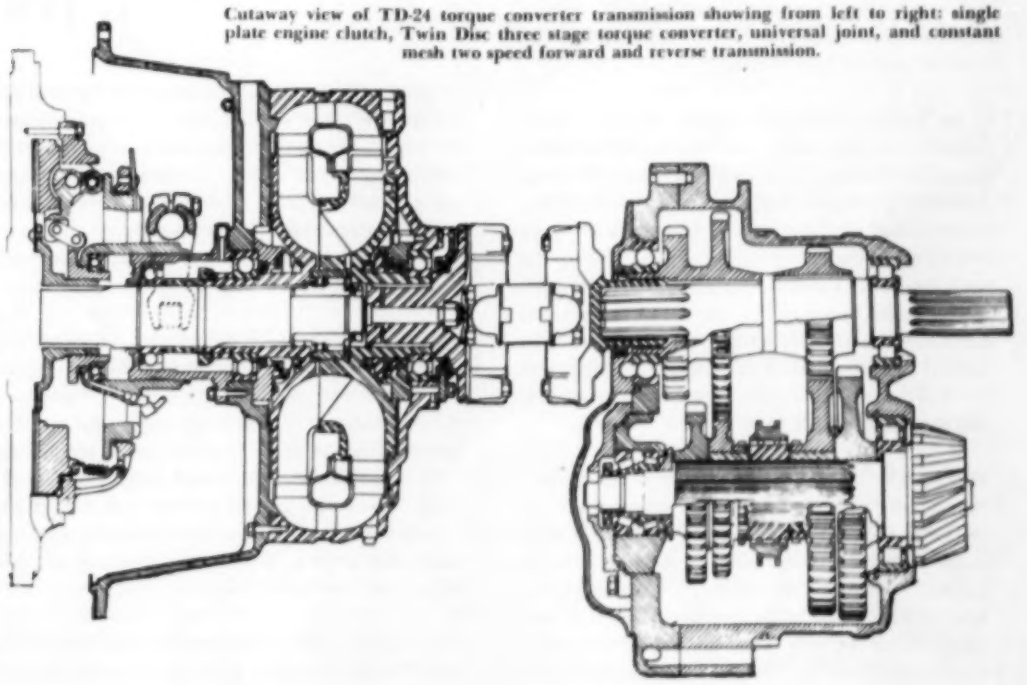
ble speeds and there is more drawbar pull available at higher speeds because the transmission automatically and instantly adjusts itself to the load requirements. In pipelaying, the control features of this tractor are important because smooth power transmission is necessary in positioning and laying the pipe, and the torque converter eliminates engine stalling which can easily occur when a heavy load is closely controlled with a conventional transmission, as is necessary in pipelaying work.

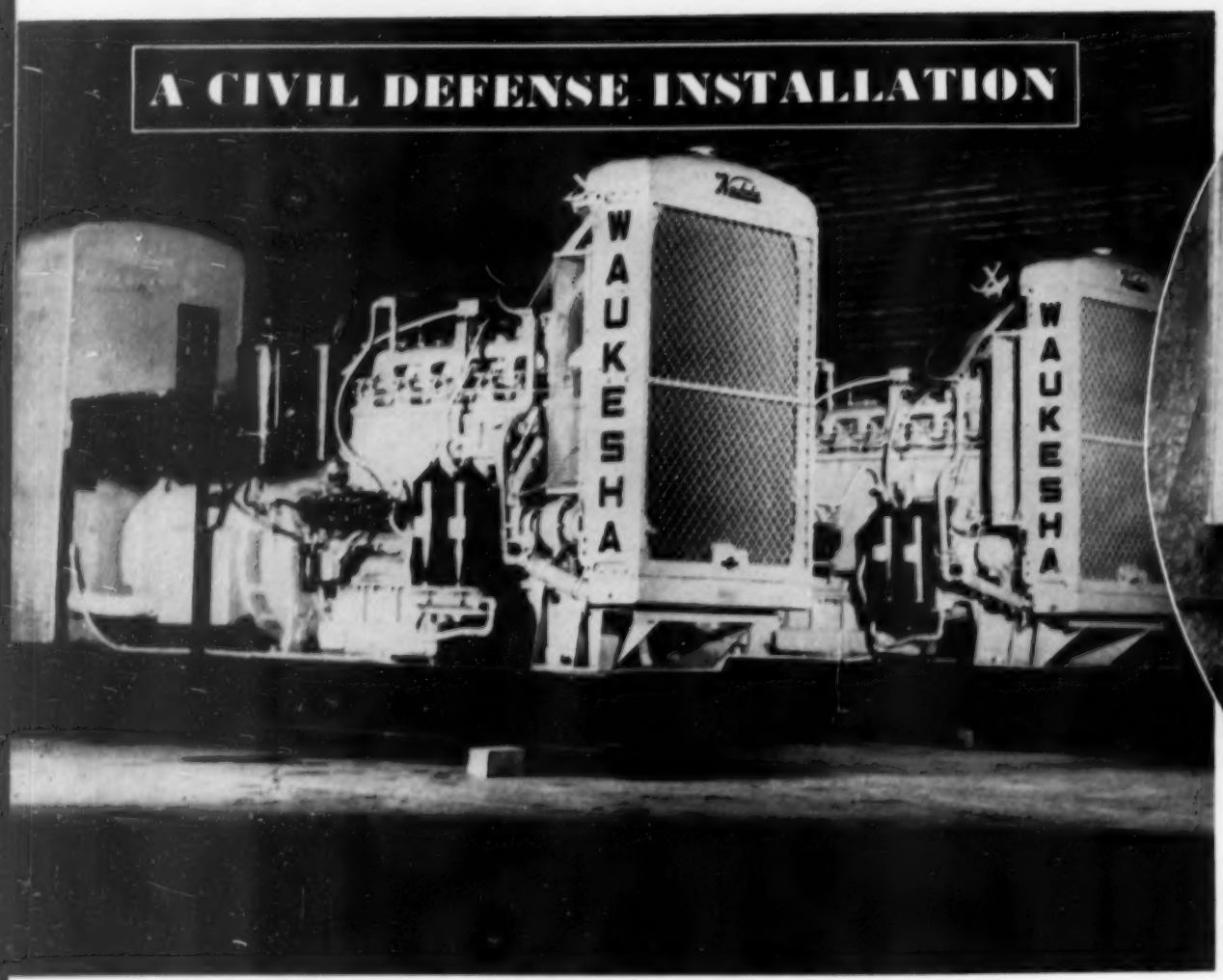
Other features in the new TD-24 include: Moving of the air cleaner from the cockpit to the left side of the engine under the hood. This gives more operating room in the cockpit, increases visibility, and provides a flat instrument panel. The fuel tank has been increased to 135 gallons, and there is a 24 volt electric starting system for the inbuilt gasoline conversion starting engine. Batteries are located in accessible positions in pairs on each side of the engine, and hood sides have been shortened to permit more elbow room in the engine compartment. Operating weight with 22 inch shoes and seven roller tracks is 42,710 pounds.

**This graph shows the drawbar pull for the TD-24 torque converter tractor for all gear ranges. The two sets of curves represent the two different gear ratios in the transmission and the two planetary steering system gear ratios for each transmission gear ratio. The drawbar pull is only calculated up to a point where the tractor is moving fast enough to be actually doing work.**

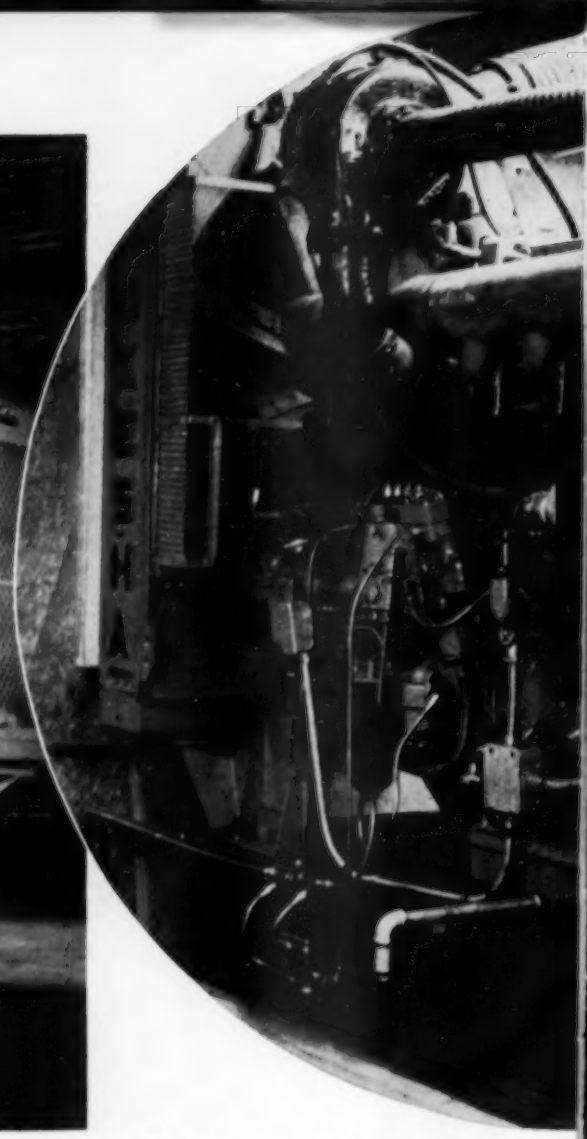



**Cutaway view of TD-24 torque converter transmission showing from left to right: single plate engine clutch, Twin Disc three stage torque converter, universal joint, and constant mesh two speed forward and reverse transmission.**






Pre-installation photo of the twin 300 hp diesels that make Friday a special day for children in Rancho Los Amigos Hospital. Engines turn at 1800 rpm.




Engines are equipped with Elliott turbochargers, Bosch fuel system,

# DIESEL GENERATOR SETS REASSURE POLIO VICTIMS

*By* JAMES JOSEPH

TO some 198 patients at Los Angeles County's Post Polio Respiratory Center (a segment of Rancho Los Amigos hospital), Friday is a special day. Kids lying in iron lungs keep asking their nurses, "When are they going to put on the diesels?" Teen-agers in portable respirators, who wouldn't know a fuel pump from an injector, ask the same thing. Yet that word "diesel" figures importantly in their lives. For, literally, they're but a piston's stroke from death.

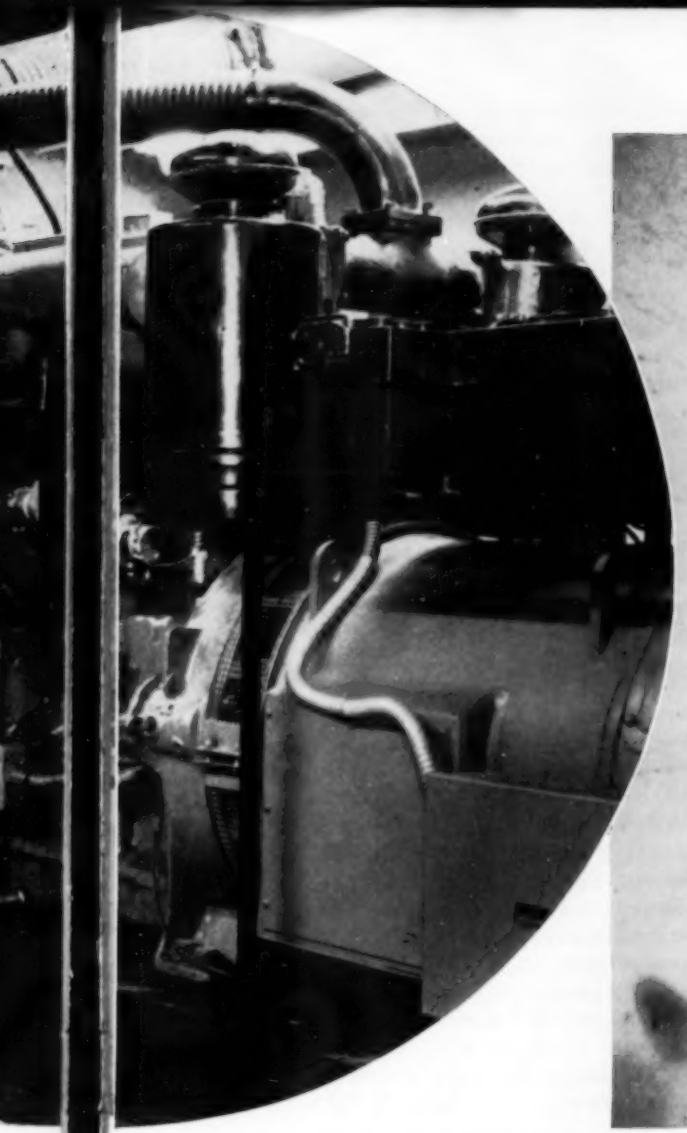
Every Friday is test day for the Center's diesel standby unit—for those twin Waukesha WAKDs, housed in the basement's sound-proofed, fiberglass-padded engine room. Sometime during each Friday, maintenance personnel shut off the main power and watch as the emergency generators pick-up the load. Up in the wards—in the respirators—198 polio patients tense and wait. No one need tell them that the standby plant is working. They can feel it by the way their mechanical lungs keep pumping, with but a moment's hesitation as main power goes off and the standbys take over.

Rancho Los Amigos' polio center is the nation's largest and newest. And there, dieselization has special purposes. Should main power fail, the Waukesha WAKDs pick up within 6 seconds what the hospital tags its "critical load". Critical circuits feed all mechanical lungs and one emergency fluorescent fixture in each ward, totaling 350-400 amps. A secondary load, the "semi-critical", carries various rehabilitation devices which aren't of life-or-death importance. The semi-critical load approximates 350-400 amps. Lastly, there's a "non-critical" circuit (another 400 amps), powering general lighting, the kitchen and administrative departments. All this makes the Center's standby diesel-electric plant one of the U.S.'s most sensitive—and most rigidly controlled and engineered.

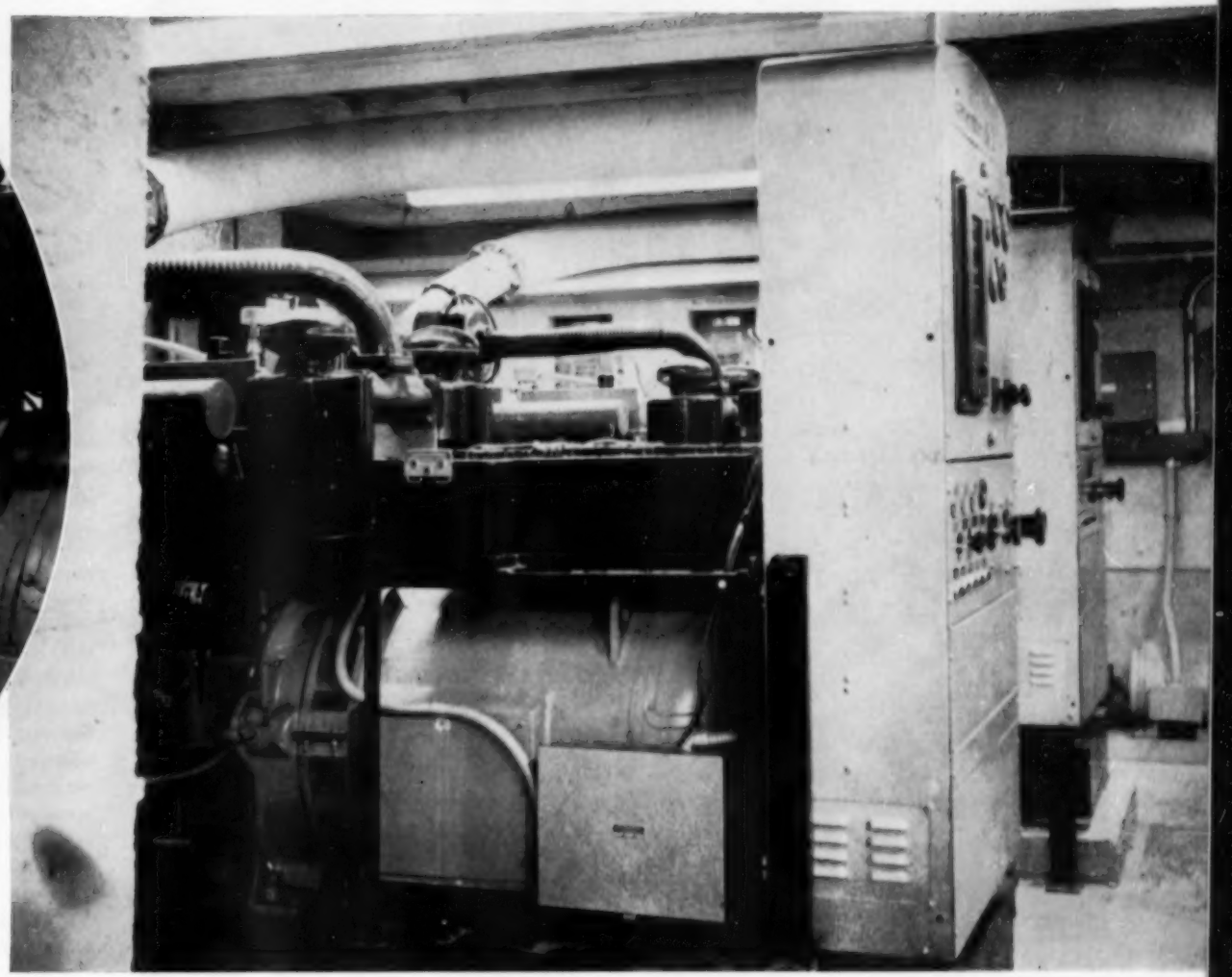
The two Waukeshas are 6-cylinder engines, rated 300 hp at 1800 rpm. They have a bore of 6¼ in. and stroke of 6½ in. Each is turbo-charged and each directly drives a 125 kw ac generator and its 125-v exciter. Generators are 3-phase, rated 156.25 kva. Each standby's full-load capacity approximates 434 amps. Thus, one power package can handle the "critical" circuit and together, depending upon the load, they can also supply the "semi-critical", perhaps even the "non-critical".

The standbys are so regulated that once on the line, they won't shut down until main power resumes. They can run overloaded (upwards of 125% of rated output) for several hours. Engines stay on the line, literally "locked in," even should oil pressure drop or engines overheat. F. J. Geraghty, plant superintendent for Hercules Electric Machinery & Equipment Co., Los Angeles, which furnished and installed the standbys, says "the generators would melt and the diesels tear themselves to pieces before they'd quit—if such an extreme case of overload ever occurred. That's how vital the installation is." The Center thus would risk ruining its engines rather than have them shut-down during an emergency. For a shutdown might mean death for the 198 young polio patients.

Overloads, low-oil pressure and too high oil temperature kick off visual and audible alarms—but the engines continue running, regardless. Engine jacket water is constantly held at standby temperature 130°f by 1250-watt immersion heaters. Lube oil lines are installed with low-oil pressure switch-gauges which are adjustable. If oil pressure falls to



Woodward governors, and Winslow lube oil filters.



Each engine has its own Custom Built Controls panel, isolated from prime mover at the generator end. Engine room is sound-proofed but silencers were not deemed necessary.

## 198 Child Patients in Los Angeles County Hospital Learn to Respect Diesel Engines: Know Their Lives Could Be Saved by Waukesha-Delco Standby Units

15 psi, the switch grounds out, sounds an alarm—but the engines keep running. Another control monitors engine water temperature, sounding the alarm if temperatures rise above 205°f. Again, engines remain operative.

Most interesting, perhaps, is the use of Custom Built Controls, responsible for starting engines upon a main power failure. Further, even when main power comes on, the standby plant "holds onto the load" for upwards of 5 minutes (depending upon the setting), to allow main power to become stabilized. Even after main power takes over, standbys continue to idle for another 5 to 15 minutes—ready to take over again.

Regulation is intricate and begins with a central control breaker on a Westinghouse panel. Should the 4160-v, 3-phase main power, incoming to the Center's transformers, fail, a relay ties each engine's batteries into Custom Built Controls, mounted near the generators. Each power package has four, 12-v batteries, two of which (a total 24 volts) are always operational while the other set is being trickle-charged. The Custom Built Control's Agastat triggers cranking and rest cycles—5 cranks of 3-seconds duration each, 4 rests of 5 seconds. The fifth "rest" actuates a "start failure" alarm (both visual and audible on the power unit's control panel.

As soon as one engine starts, and reaches 59 cycles (can vary between 59 and 61 cycles), that engine is automatically locked into its load. As the other diesel set reaches load frequency, and voltage, it is automatically paralleled with the first, and both go on the line. Whichever the case, the "critical" circuit (which is always closed) is first powered. If there's power to spare, then the second circuit, carrying the "semi-critical" load, is powered. And so on, down to the "non-critical". Continuously, while the standbys are carrying their loads, their output may be automatically switched back and forth, picking up one of the less critical circuits or dropping it, depending upon load variations. But the "critical" is always powered. All this is accomplished through a series of breakers and relays on a main switchboard.

The big main panel houses a number of electrically-powered circuit breakers. Each of the three circuits is individually breakered, the load automatically shifted from one to the other, according to priority and available power. In addition, meters monitor each generator set's output frequency and voltage. These meters and their breakers throw the generators onto the line when they come up to frequency and voltage. Another breaker actuates a time delay circuit—which in turn throws the Custom Built Control into action. This delay breaker keeps the Custom Built cycled for upwards of 5 minutes after main power has been restored—thus maintaining the diesel engines on standby.

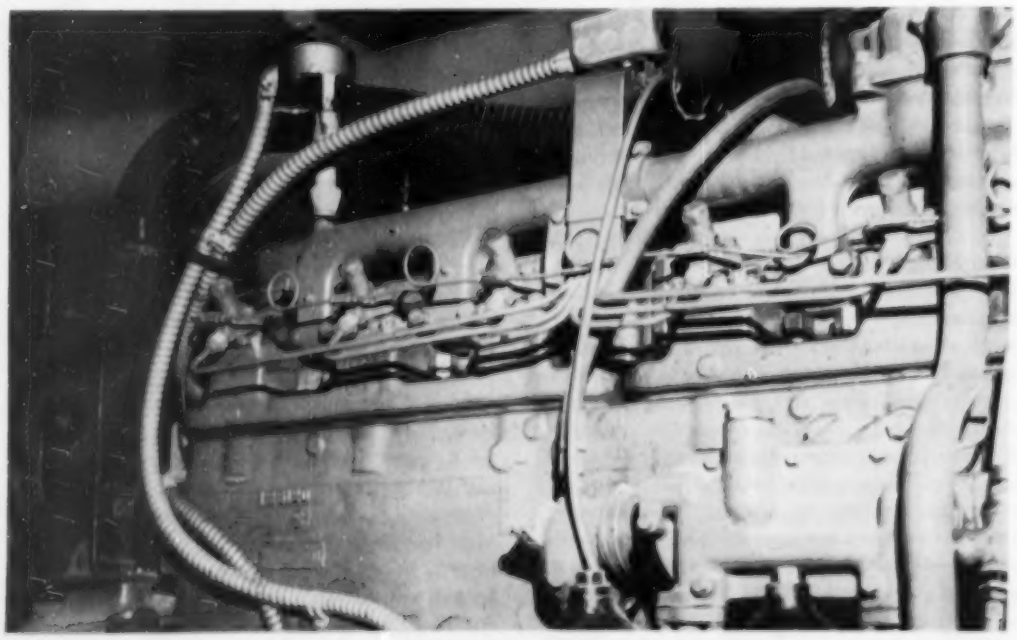
Both engines are fueled from a 50-gal. day tank, mounted on the floor between them. Atop the tanks is a 60 gpm pump, drawing fuel from two, 900-gal. underground storage tanks. Fuel level is monitored by individual meters. The fuel pump-motor set is controlled by a Mercoid float valve in the day tank. To assure quick start-ups, the Bosch injection system on each engine is continuously pressured by a pump working off each set's 24-v batteries. About 3 psi positive pressure is maintained on the Bosch units at all times, and for several reasons. First, it's a safety feature since injectors are pump-fed, rather than gravity-fed from

**Custom Built Controls monitor each Waukesha. In case of a power failure, these controls start up engines in 6 seconds. A full alarm system is provided but no automatic shutdown is allowed in the hospital.**

the day tank. Any failure, no matter how slight in the transfer pump's operation might delay engine start-up—might prevent the standbys taking their loads in the requisite 6 seconds. Similar delays could be caused by air-pockets in the fuel line. So 3 psi is maintained on the pumps at all times.

Another safety device is the governor dumping set-up. Two solenoids, both controlled from the Custom Built unit, are involved. One solenoid normally keeps closed the fuel oil line from engine to governor. The other solenoid normally keeps open the line from governor to engine sump. When the engine starts up, solenoids reverse themselves, opening the engine-to-governor line, closing the sump-dump line. When the engine goes off its load and shuts-down, solenoids revert to "normal, non-operative" position, dumping the governor's oil back into the engine sump. A Synchro-Start solenoid monitors the governor, shutting the engine down if rpm exceed 10% of rated speed, or if frequency rises above 65 cycles for any prolonged period. This is a runaway safety, the only automatic control that will shut the engine down, rather than merely sound alarms.

**Starboard view of an engine shows low-pressure and jacket-water switch gauges which will ground out and sound the alarm but will not stop the standby unit despite temperatures and pressures.**



Each engine has two Winslow Full Flow lube oil filters and two Vortox oil bath air cleaners. Closed-circuit radiators for each set work from a single plenum chamber. The chamber's louvers open automatically the moment main power fails. An outage triggers a standby compressed air circuit, hydraulically operating the louvers.

Since the diesel-electric sets are installed beneath the Post Polio Center's administrative office, in the same building as convalescent wards, noise suppression posed some problems. Yet, as if to contradict this, there are no exhaust silencers. Both engines simply exhaust through separate 40-ft. pipes, running up through the building and exiting above the roof. Engineers say the Elliott turbochargers effectively break up sound and that mufflers weren't needed. Otherwise, the engine room is heavily soundproofed: (1) walls and ceilings are padded with fiberglass; (2) engine beds are isolated by fiberglass from their reinforced concrete bases, and all engine mounts are cushioned with neophrene washers. So effective is this sound-proofing, that engine operation is not audible in the wards.

The panel for each engine is mounted on a separate base, adjacent to the generator, but physically isolated on its own fiberglass insulated channel-iron stand. Individual engine panels contain: (1) a Silverstat regulator; (2) individual phase meters; (3) frequency and voltage indicators; (4) water temperature meter, oil pressure indicator and amp-meter; (5) five warning lights— "start failure", "generator overload", "overspeed", "hi-water temp" and "low oil"; and a field rheostat.

Yes, for 198 polio patients at Los Angeles County's Post Polio Respiratory Center, Friday is a special day. To patients in iron lungs, rocking beds, and portable respirators, presence of the diesels and their weekly tests are reassuring, for death is but a piston's stroke away.

## List of Equipment

Engines—Waukesha (2) WAKD diesels; 6 cylinder, 300 hp at 1800 rpm, 6¼x6½ in.
Generators—Delco.
Turbocharger—Elliott.
Start-Up Controls—Custom Built Controls.
Governor—Woodward.
Fuel Injection System—Bosch.
Lube oil filters—Winslow.
Air filters—Vortox.
Fuel oil filters—Fram 3-stage Filcron.
Fuel pump—Roper.
Fuel level meters—Liquidometer.
Engine control, transformer and main standby control panels—Westinghouse.

# AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

**Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.**

## SIMPLIFIED INJECTION SYSTEMS

**The Simplification Of Fuel Injection Systems By Several Producers Is Lowering The Cost Of Small Diesels And Making Their Use More Popular: Cummins, Bosch And Roosa-Master Are Leaders In This Trend**

GREATER popularization of small diesels in the automotive, farm tractor and industrial fields has been retarded somewhat heretofore by the relatively higher prices of diesels as compared with gasoline engines of the same power output. Not a small part of the higher price of the diesel is accounted for by the cost of injection equipment.

Accordingly several producers of injection pumps, both proprietary and those who manufacture them for their own engines, have addressed themselves to the problem of so simplifying their systems that they may be sold for considerably lower prices, thereby increasing the market by encouraging greater production of smaller diesels.

Basic in all of the new pumps are simplicity and compactness. Several of them also have added built-in features which heretofore have required the addition of auxiliary accessories, such as governor and variable injection timing devices. Among the additional features included in some of the new pumps are so-called torque control and excess fuel delivery at starting. No basic innovations in principle are found in these new pumps, since most of them hark back to old principles found in some of the earliest injection systems. In their revival, however, the limitations of the early schemes seem to have been overcome. In the new Cummins PT system, for example we see a return to the common-rail principle; but differing from the original in that the fuel is delivered to the injectors at considerably less than injection pressure, the final boost being provided by the unit injectors. In the Bosch and Roosa-Master, of the so-called single plunger type, a single injection pump, comprising opposed plungers in a single barrel, is used to deliver the fuel to hydraulic-type nozzles through a distributor.

It is interesting to note that while Cummins has abandoned the distributor, which was used in its older pumps, Bosch, which formerly avoided its use, employs it in its PDA model. Objection to the distributor has always been its liability to serious damage if the passage of fuel through it is cut off, as in an emergency stop or when coasting or drifting. This damage arises from the fact that lubrication depends solely upon the fuel itself. In some engines this has inhibited full fuel cut-off in coasting, thus depriving the vehicle of the inherently high retarding or engine-braking of the diesel.

In the Bosch and Roosa-Master, however, this objection seems to have been overcome by the fact that the distributor in each case consists of a small-diameter rotor with radial ports, the same rotor serving both to meter the supply of fuel to the pump and to distribute it to the nozzle feed lines. Whether the fuel is being delivered to the nozzles or not, the rotor is exposed to the fuel in the gallery at all times. Its small diameter and relatively low surface speed, together with the distribution afforded by its ports should accordingly serve to maintain an adequate film over its surface.

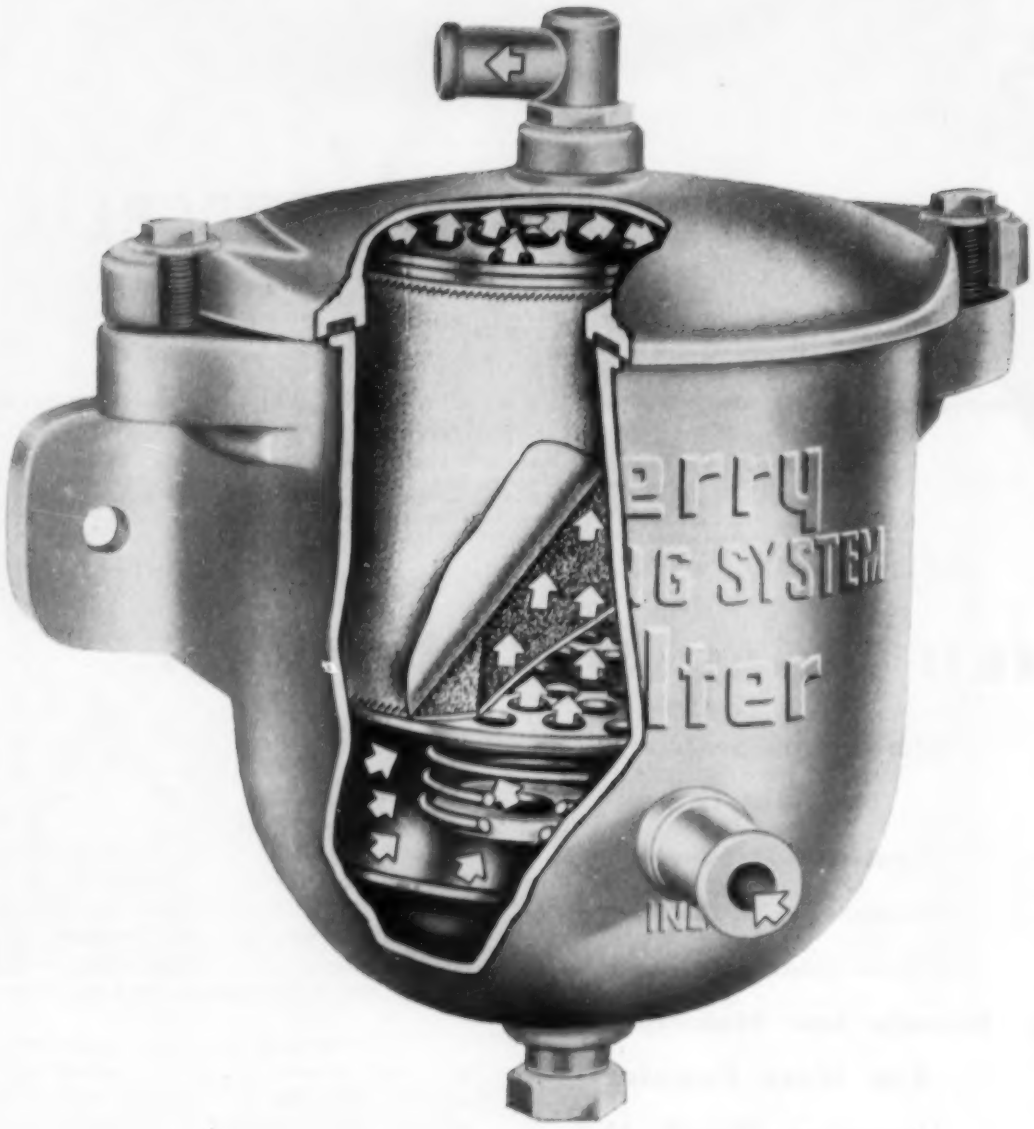
Essentially these two pumps achieve their simplicity by employing a single pumping element to supply all of the nozzles, instead of a separate one for each. Thus the greatest single item of cost, namely the finely-lapped surfaces of the plunger and barrels is drastically reduced. Further simplification is gained by the use of a rotary type of transfer pump in place of the lapped plunger and barrel type used heretofore. Although the single rotor must be lapped to high precision, this item of cost is more than offset by the elimination of the helical depressions in the plungers of the multiple-unit-type and of the camshaft, lifters and guides.

In both of these pumps, metering is accomplished by a single element, consisting of a ported sleeve about the rotor, thus dispensing with the intricate rack and pinions employed in multiple-plungers.

Simplification in the Cummins PT pump is of a different sort. Actually the Cummins pump, as heretofore, is not, strictly speaking, an injection pump; but is more accurately classified as a metering transfer pump, since final injection pressure is produced in the individual injectors in the cylinder heads. However, it is greatly simplified as compared with its predecessor, the pressure being produced by a single, simple gear pump, the common rail delivery to the injectors having eliminated the need for a distributor.

Unlike other current injection systems, the Cummins PT meters by pressure and time, whence its name, and not by volume delivered by the pump. Metering is accomplished simply by controlling the pressure in the common rail. This, of course, is an enormous simplification and offers the additional possibility of insuring more even metering as between cylinders. There has been no essential simplifying of the injectors, though important improvements have been made in their design.

Without doubt these simpler injection systems, with their greater compactness, lighter weight, and, above all, lower prices will do much to render the small diesel more attractive; but it remains to be seen how their length of life will compare with the types used previously.




Cutaway drawing of the Perry cooling system filter showing the direction of water flow through its various components.

AN engine runs not only on its fuel and lube oil, but, as is often overlooked, on its water too. In the final analysis, the damage which can be done by water is a long range effect that usually is not immediately apparent. It is, therefore, more serious when finally discovered.

Water, despite any apparent clarity, varies in its quality in innumerable ways from locality to locality. Whatever its source, water almost always contains impurities of various natures. It may, and often does, possess dissolved mineral matter, dissolved gases, sediment and turbidity, organic matter and micro-organisms. An awareness of these hazards to engines led the Perry Filter Division of the R. M. Hollingshead Corp. of Camden, N. J. and Sunnyvale, Calif., to develop a product that is proving highly successful,—the Perry Cooling System Filter-Conditioner.

In diesel and other internal combustion engines, the deposit of scale in the water jackets can cause

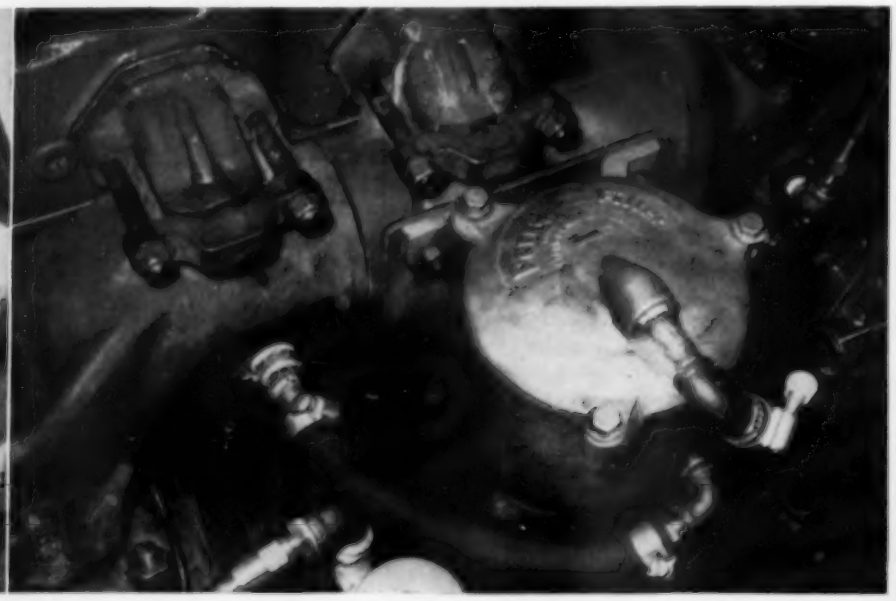
## ELECTRO-

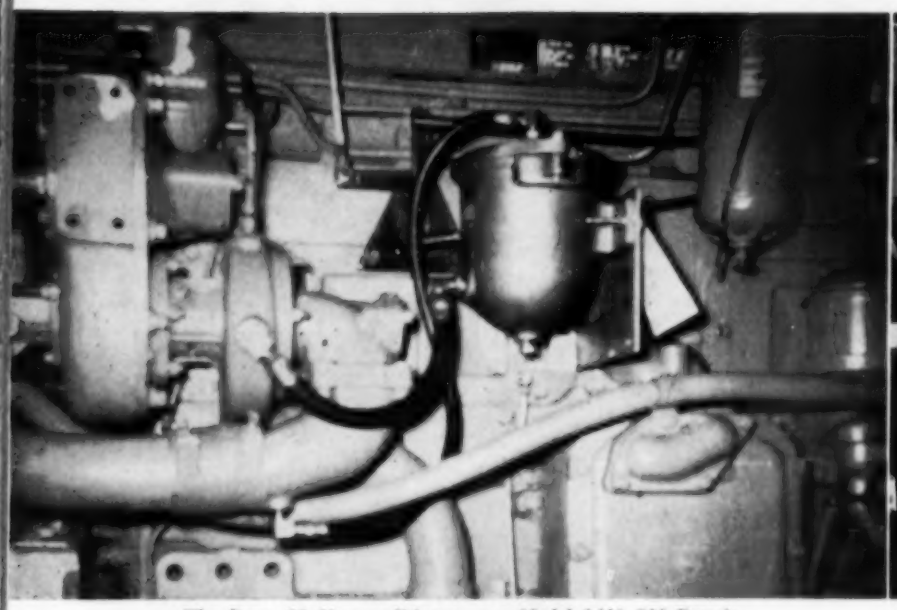
serious cooling problems in addition to drastically cutting the efficiency of the engine. Diesel engine cylinder heads are particularly prone to fracturing from the deposit of scale. As the scale deposit increases in thickness, the amount of heat dissipated decreases. The result is that the metal becomes highly overheated and eventually becomes a replacement or repair problem.

Corrosion in engines is another matter in which water plays the chief role. The most common type of corrosion is due to the oxygen in the dissolved air of the coolant. Corrosion of this nature can be greatly accelerated by low alkalinity and high free carbon dioxide. Temperature is also a factor to be considered, and temperature is affected by the amount of scale present. Water containing a min-

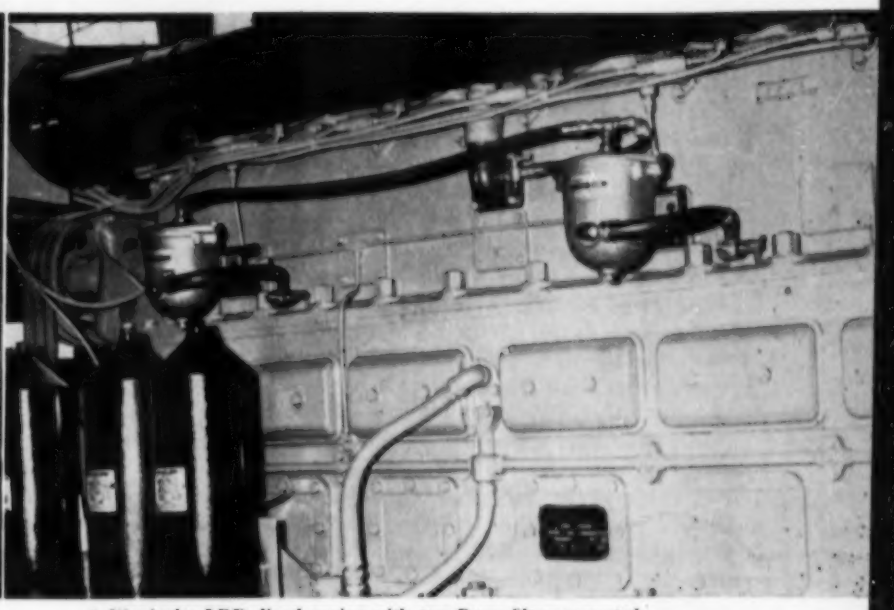
A view of a GM Cleveland Division diesel generator set equipped with a Perry water conditioner filter. It is owned by Duval Engineering & Contracting Co. of Jacksonville, Florida.

A Perry cooling system filter mounted on a Cummins diesel engine installed on a highway truck.





The Perry CS filter-conditioner on a Model 6-110 GM Detroit Diesel Division engine installed on the fishing craft *Caroline*.



A Waukesha LRD diesel engine with two Perry filters mounted on its side. Note the Winslow oil filters.

# CHEMICAL WATER CONDITIONING DIESELS

*By* SIDNEY HOFFMAN

eral acid must obviously be neutralized since it tends to dissolve the metal and wash it away. Turbid water containing either coarse sediment or fine particles in suspension is also troublesome. Iron and manganese bacteria, known as "crenothrix," becomes a concern where waters containing those minerals are used. They form masses which slow flow rates and often break off to block passages.

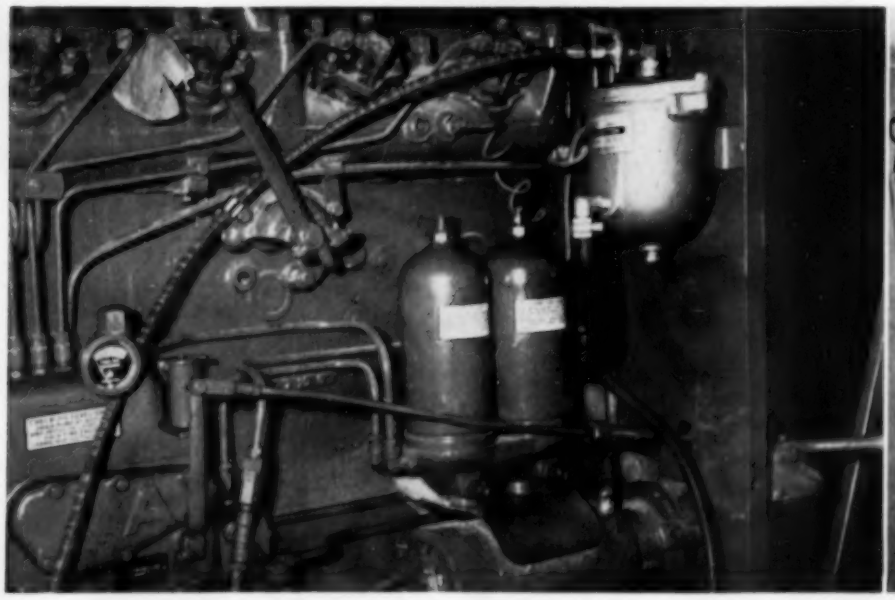
In large stationary diesel plants, the problems are compounded because of the quantities of water used. However, because it is possible to install the necessary water treatment equipment—however cumbersome it may be—in large stationary plants, it is fairly easy to eliminate much of the damage that may be caused by water. On the other hand, the conditioning of cooling water in comparatively high-speed medium and small size diesels of the type used in oil well drilling rigs, marine applications, irrigation pumping, truck and tractor, and other similar uses, presents another problem.

First, it is generally not possible to be assured of fully treated water wherever and whenever it is needed. Second, since the space available is usually severely limited, a small, compact treatment unit is essential if the water is to be treated at all.

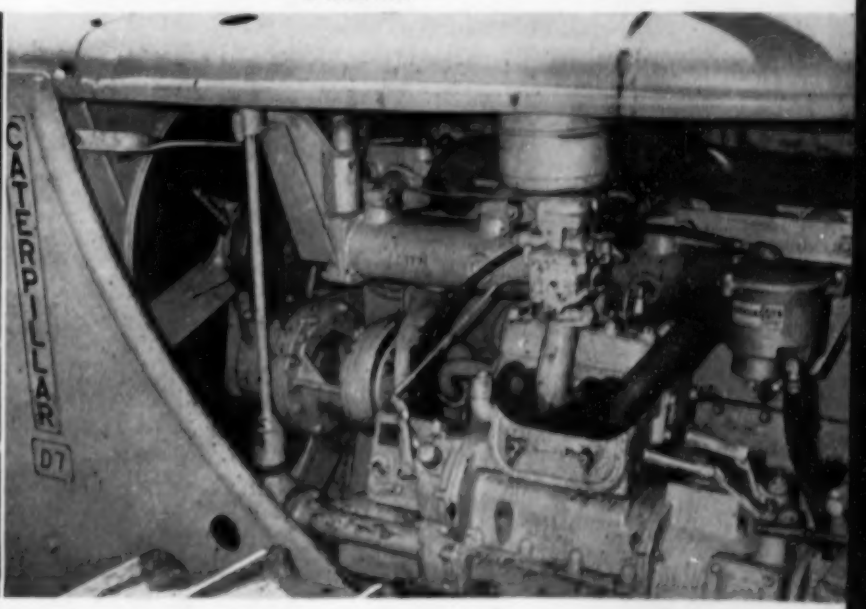
The Perry Cooling System Filter-Conditioner is such a unit. Its effectiveness on automotive, industrial and marine diesels is such that the Detroit Diesel Division of General Motors has made it standard equipment on many of its engine models and optional on others. This cooling system filter-conditioner provides for the mechanical filtration of loose scale, rust and visible impurities; mineral softening of the water which minimizes scale formation; control of the acid and alkaline content by means of chemical buffering agents; the addition of inhibitors to prevent rust; and the reduction of pitting by the corrosion resistor plates in the filter assembly.

In addition to GM's Detroit Diesel Division making the Perry unit standard or optional on all its models, several other engine manufacturers have approved the cooling system conditioner since its introduction. It is easily installed and serviced. Installed correctly and properly grounded, it adds considerably to the life of many engine components and helps keep the engine at rated performance.

An International stationary diesel is shown here with the Perry conditioner-filter for water treatment.



A Perry filter installation on a Caterpillar D-7 crawler tractor. The outlet line is tee'd into lower radiator line where bleed line is connected.



# GREAT BI

by Thomas

WE are a nation of slogans, even to the point of advertising our home state's particular advantages on our license plates. In Kansas, for example, the tag proudly displays the motto "The Wheat State". And this is certainly true, for Kansas is the nation's leading wheat grower. In the heart of Kansas lies a rich wheat farming region with Great Bend as its "capital".

Just outside the west city limits of this rapidly growing city are the headquarters and power plant of the Central Kansas Electric Cooperative, Inc. This Cooperative serves part or all of nine counties over an area that is generally 60 by 80 miles in size. In this territory are some 4500 consumers, including residential and farm homes, farm irrigation, public buildings, small commercial establishments, public street and highway lighting and a number of diversified industrial and commercial enterprises. These consumers depend upon the CKECI for a reliable source of electric energy. Their faith has been demonstrated by an increasing demand for power, with the result that the Cooperative has recently installed additional generating facilities to bring the plant's installed capacity to 10,520 kw.

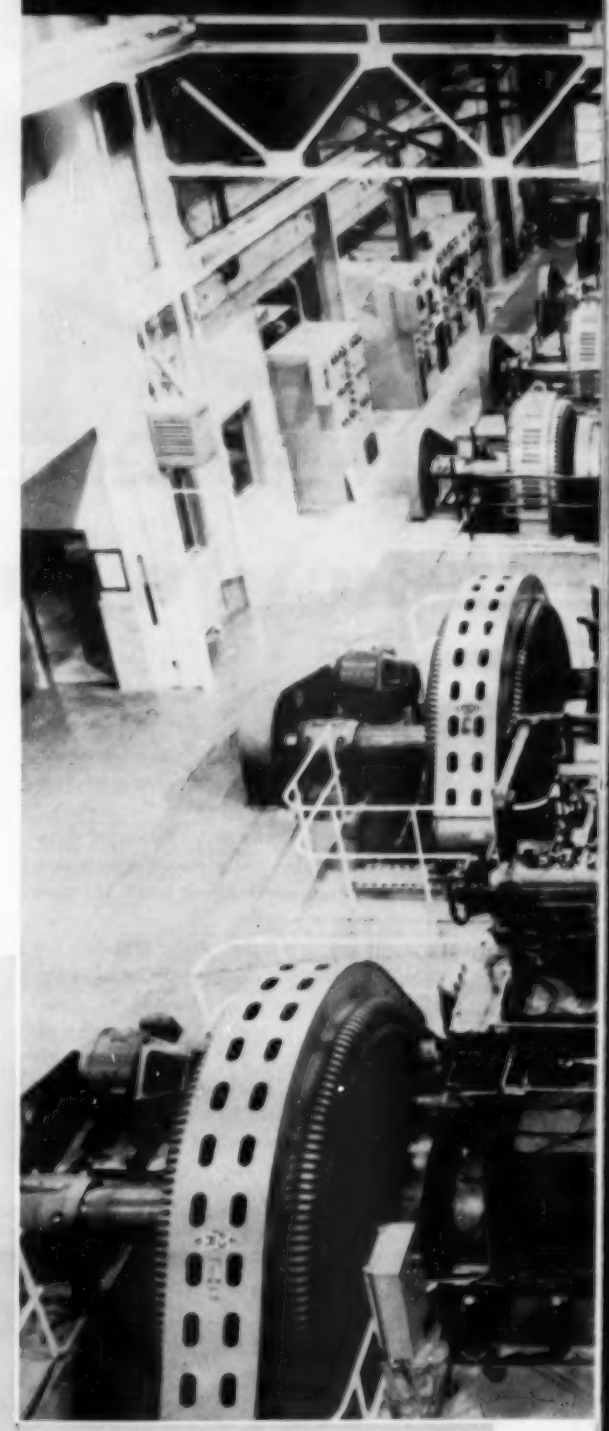
The growth of the Cooperative has been rapid and at the same time substantial. It is so efficiently managed and operated that the plant placed fifth in the 1954 competition among REA internal combustion stations. Winner of the DIESEL PROGRESS Efficiency Plaque will be announced and its plant described in the May issue of DIESEL PROGRESS. Organized in July 1939 by only 20 men, the Cooperative began operations in 1941 with 105 miles of distribution system. This has since grown to 2850 miles of distribution line, including 150 miles of 69 kv and 44 kv transmission. During its first years of operation, the Cooperative purchased its power requirements. However, the time was soon reached when self-generation proved more economical, and in August 1947 two dual-fuel Worthington engines rated 1000 kw (1440 hp) each were placed in service. Incidentally, these were among the earliest dual-fuel installations for electric generation in the midwest. Load growth soon dictated a plant expansion, and in January 1950 two additional units went into operation. These are also Worthington dual-fuel engines, rated 1160 kw (1645 hp) each.

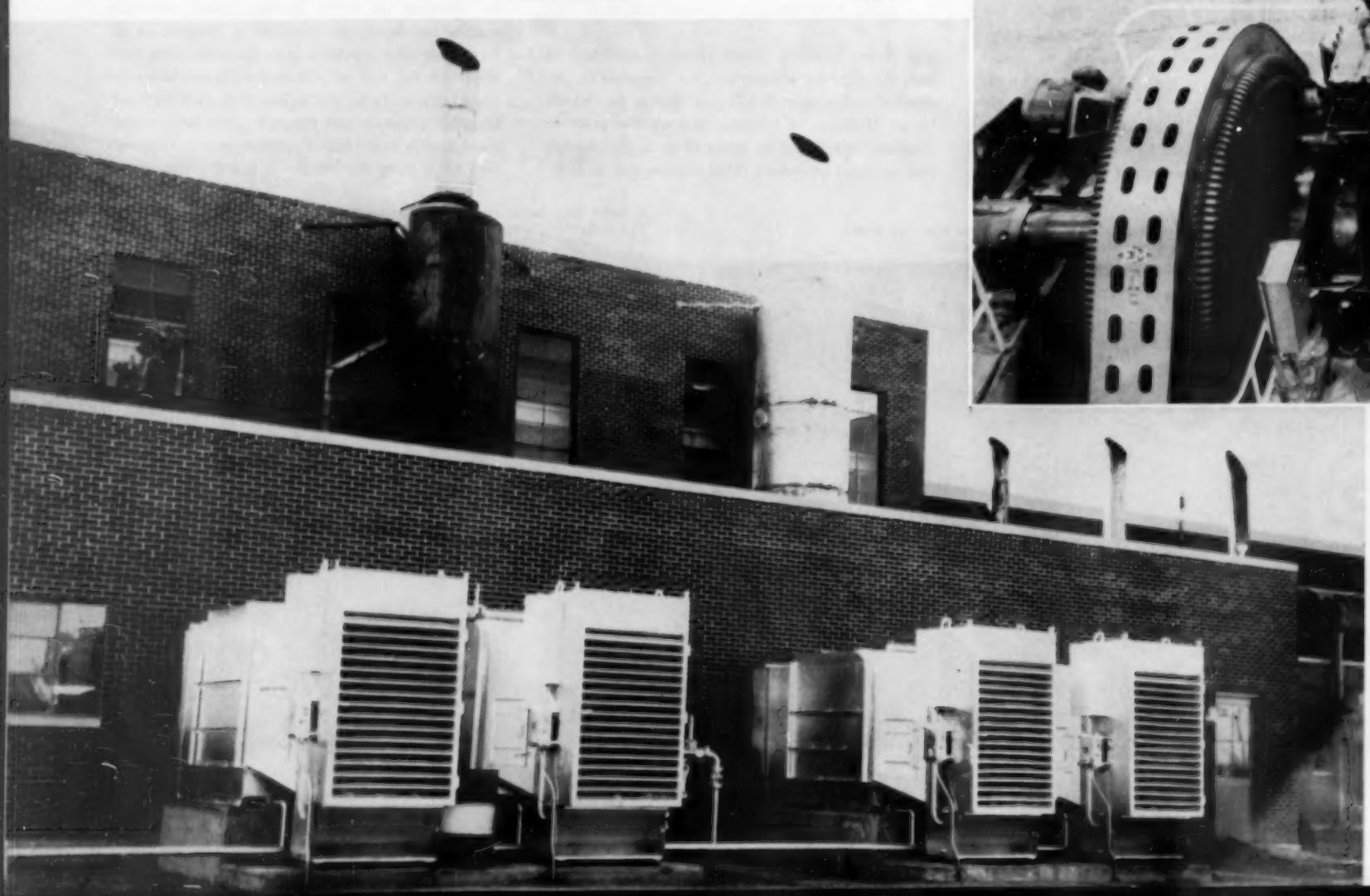
An engineering study of the generation, transmission and distribution systems in 1952 indicated the need for various improvements, including additional power supply. Several methods of increasing this supply were studied, including purchased power, installation of steam turbines and further installation of dual fuel engines. An economic comparison showed the latter to be most desirable, and the program was initiated.

A number of equipment and construction con-

**Thomas C. Kirkwood is a partner in the Kansas City consulting engineering firm of A. C. Kirkwood & Associates.*

***H. P. Ehrhard is senior mechanical engineer with the same firm.*

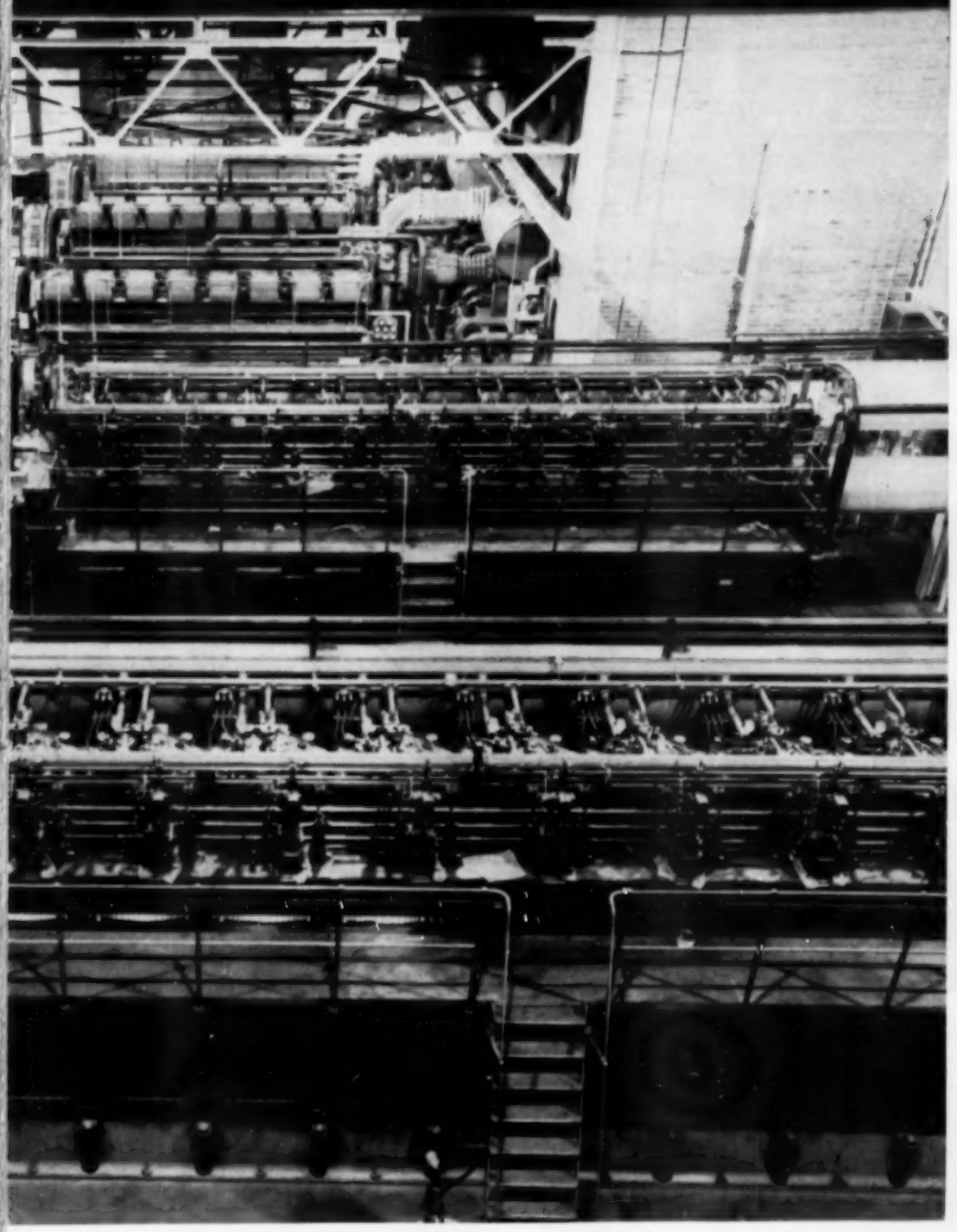




**American Air Filter travelling screen type filters, direct-connected to Marley Aquatowers for filtration and cooling of intake air. Above are the two Burgess-Manning exhaust silencers used at Great Bend.**

# BEND, KANSAS - REA

C. Kirkwood* and H. P. Ehrhard, Jr.**



**Looking down into the engine room of the Great Bend REA plant. Two new Baldwin-Lima-Hamilton engines are in the foreground, with four Worthingtons in the background.**

tracts were awarded by the Cooperative for the overall plant expansion. The first and largest contract was for the two engine generators and associated equipment, which were purchased from Baldwin-Lima-Hamilton. Each unit is a 9-cylinder, 21½ in. x 27½ in., 257 rpm, two-cycle engine driving a 3400 kw Electric Machinery generator. The type G-921-SA engine has a gross rating of 4800 bhp on both oil and dual fuel. Scavenging air is supplied by a 400 hp motor-driven centrifugal blower directly connected to the generator terminals, giving the unit a net rating of 3100 kw. The units are guaranteed to carry a 10% overload for two hours and have exceeded this in actual operations.

Each engine receives about 20,000 cfm of intake air through a twin set of filters and cooling towers, used to clean, humidify and cool the air. The filters are of the travelling screen type using an oil bath, and were supplied by American Air Filter. The cooling units are also used to cool the aftercooler water to 80°f.

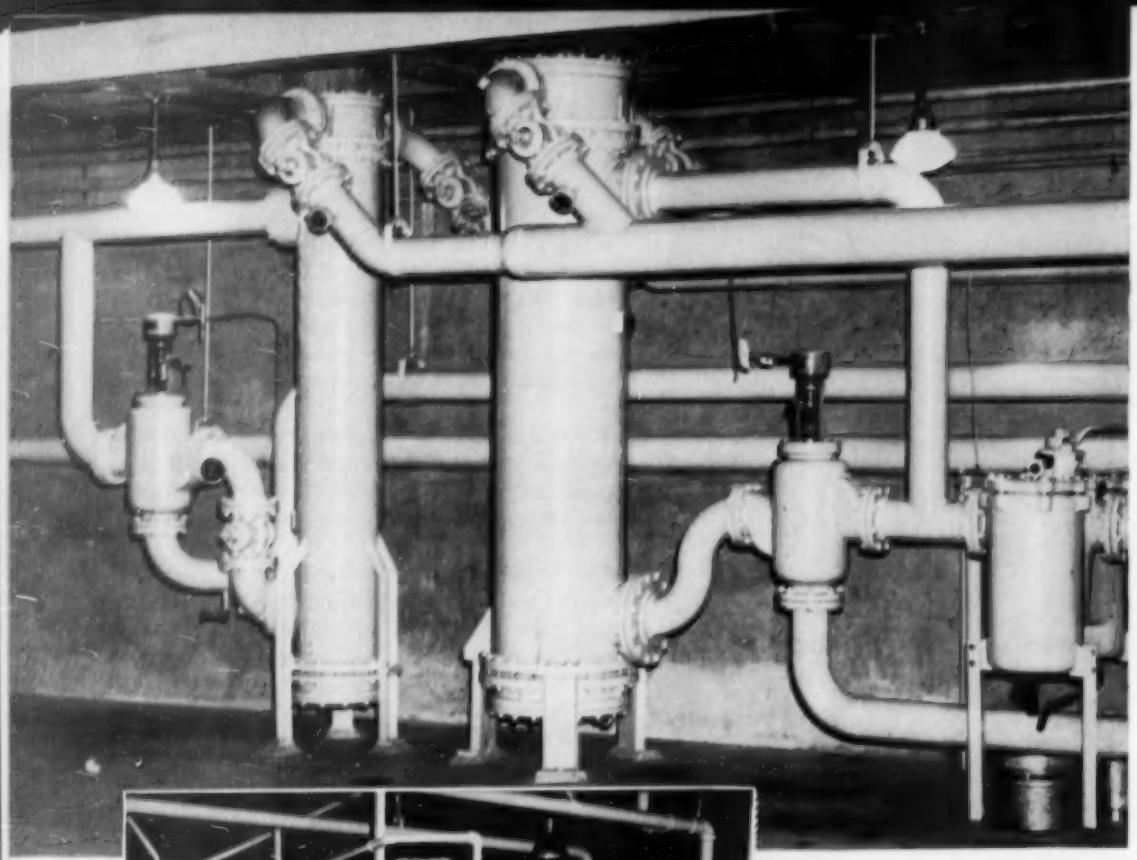
Scavenging air for each engine is supplied by a Roots-Connersville centrifugal blower driven by an Electric Machinery 400 hp, 4160-volt motor. A system of motor-operated vanes is used to adjust the amount of intake air in accordance with the engine load. The vane control is mounted on the engine gaugeboard, and automatically adjusts the vane positions until the blower motor current is in proper proportion to the generator current at the particular time. The intake air then passes through the Young aftercooler to the engine.

The gaugeboard was manufactured by the Westinghouse Electric and contains the alarm system panel and operating devices, temperature and pressure gauges and blower controls and instruments.

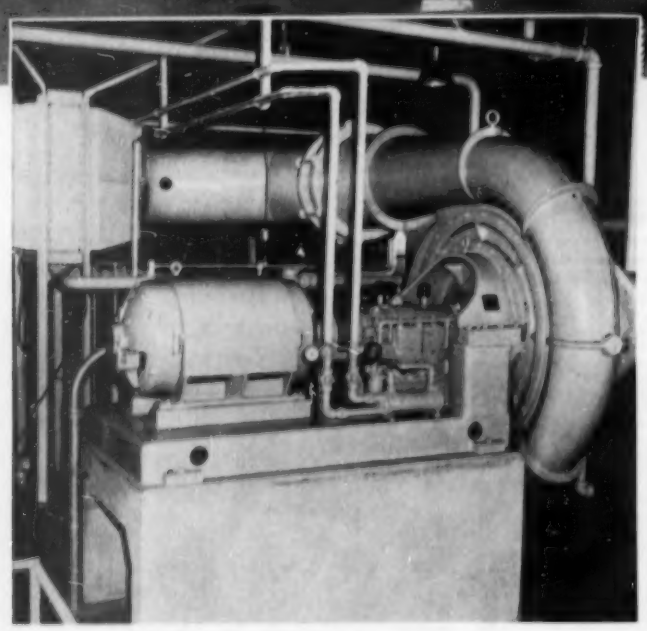
The blower motor is protected by overcurrent relays which shut the unit down in case of motor fault. Also included is an automatic starting-up sequence which provides for excitation of the exciter field from the station battery until the generator voltage reaches a predetermined level, at which time the circuit is transferred to self-excitation. Such a procedure is needed in order to provide the maximum generator voltage possible for the blower motors during start-up.

The "Panalarm" alarm system responds to abnormally low values of pressure in the engine lubri-

**Each new engine has individual Westinghouse guage-board for guages, alarm system, intake air controls, and Alnor pyrometer.**

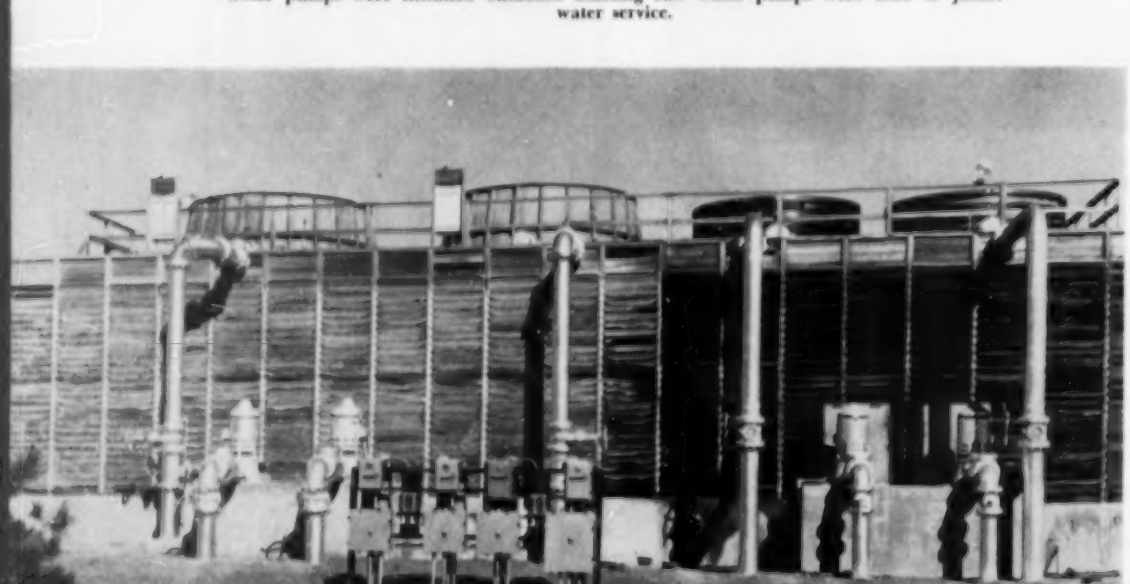


Ross water and lubricating oil coolers are supplied from raw water header, controlled by Fulton-Sylphon 3-way valves in oil and jacket water systems.



Roots-Connersville scavenging air blower is of centrifugal type, driven by Electric Machinery 400 hp motor. Air volume is proportioned to engine load by means of automatically controlled vanes on the blower inlet. Young Radiator air aftercooler shows in upper left.

Two cells were added to the Marley cooling tower for the new engines. New F-M cooling water pumps were installed outdoors. Existing raw water pumps were used to jacket water service.



cating oil, blower lubricating oil, fuel oil, fuel gas, jacket water and raw water systems, as well as to high engine lubricating oil temperature, and high jacket water temperature. The Mercoid actuating elements are all gaugeboard-mounted. Shutdown devices which stop the supply of fuel and open the main generator breaker are actuated by overspeed, low engine or blower lubricating oil pressures, low fuel oil pressure, blower motor short circuit and generator differential relay operation.

Indoor metalclad switchgear for the two new units and for substation feeders was furnished by General Electric. The breakers have a rated interrupting capacity of 250,000 kva at 4160 volts. The generators are protected by overcurrent, differential and reverse power relays. During this project extensive modifications of the electrical system were made. In the substation, two 44 kw bays were modified for 69 kv service and a third bay was added. Another 12.5 kv feeder was connected and new oil circuit breakers were installed. Two 5000/6250 kva 4.16-69 kv and one 3750 kva 4.16-12.5 kv transformers were installed. All substation equipment was furnished by Westinghouse. In the power plant, the existing 2400 volt switchgear was modified to connect generators No. 1, No. 2 and No. 3 in a unit arrangement with three existing transformer banks in the substation. Generator No. 4 was reconnected to the new switchgear.

A building extension of approximately 82x100 ft. was made to accomodate the two new units. Space was left to house a third unit of the same size class. A 10-ton electrically operated crane was installed in such a way that loads can be transferred from it to the existing crane in the older section of the building. Although the building generally is of brick, the end wall is made of aluminum panels, permitting reuse of the wall after any future extensions. Included in the plans were a new office more centrally located, shop space, an injector test room and enlargement of the locker room. Four air exhaust fans for engine room air circulation were installed.

Additional cooling tower capacity was needed with this improvement program. Two cooling tower cells were added to match in all respects the existing two cells which were manufactured by Marley.

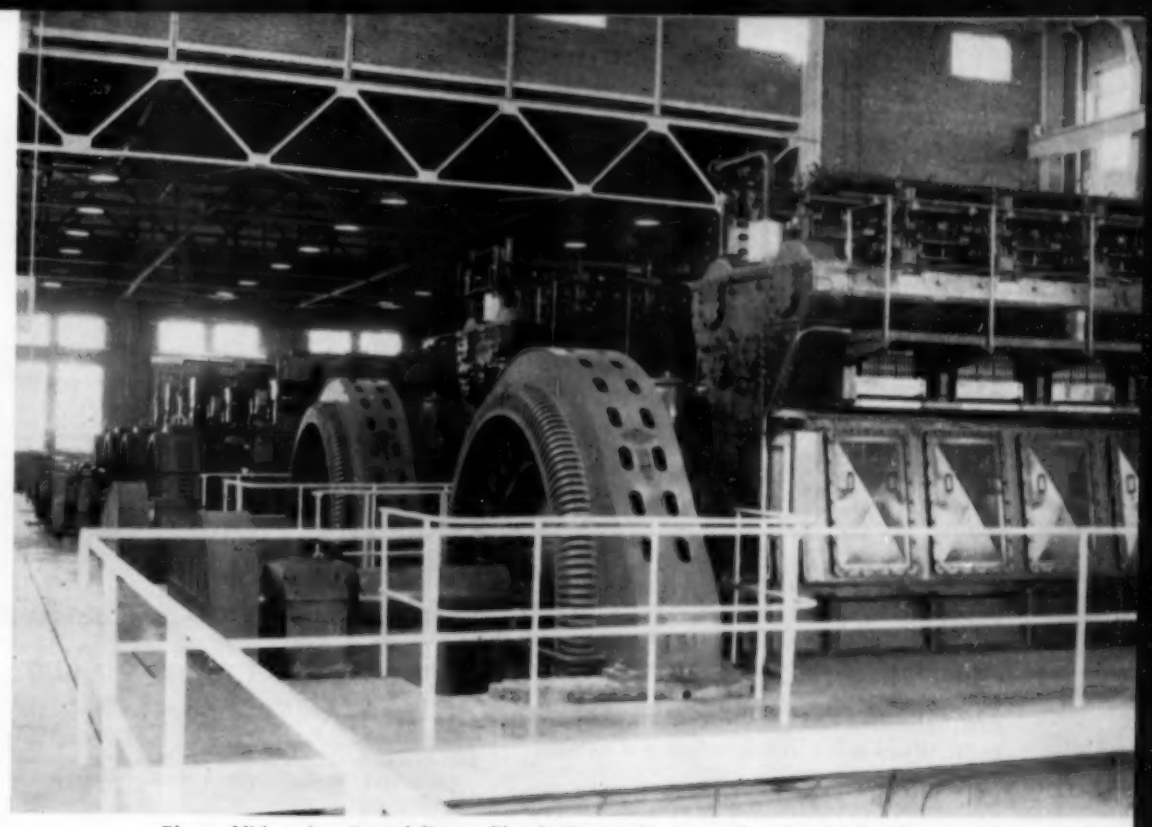
In addition, the old cooling water pumping system was replaced by four new vertical turbine pumps, furnished by Fairbanks, Morse, installed in two sumps adjacent to the tower basins, two pumps to each sump. The sumps are interconnected so that maximum flexibility is obtained. To also give increased flexibility, a loop header for the cooling tower water was installed.

Vertical shell and tube heat exchangers are used to cool the lubricating oil and jacket water with cooling tower water as the cooling medium in each case. Jacket water pressure is obtained for each engine through the use of one new Peerless centrifugal pump and one existing Worthington centrifugal pump made available by the installation of the new cooling tower water pumping system outlined above. Oil and jacket water temperatures are controlled by Fulton-Sylphon regulators.

The units have been in operation for several months, but fuel economy test dates will not be set until all other phases of the work have been completed. Also, the Cooperative has scheduled overhaul of its Worthington units prior to the tests. The total cost for the complete project, including engineering, will be about $1,540,000. Of course, this includes many items not chargeable to these particular engines, such as additional building space, new switchgear and modifications to existing gear in excess of that needed for the new units, substation additions and changes.

The manager of the Cooperative, acting under the policies set by the Board of Trustees, is Jack D. Goodman. Operation of the power plant is the responsibility of Superintendent Murlin Cole. Consulting engineers for the Cooperative are A. C. Kirkwood & Associates of Kansas City, Missouri.

During the period of the past two years the Cooperative has invested over $2,000,000 in the power plant and the distribution and transmission systems for the purpose of improving electric service to its customers. This speaks well for the past service the Cooperative has rendered to its consumers and foretells a good future for the Central Kansas Electric Cooperative and the area it serves.



**Plant addition gives Central Kansas Electric Cooperative a capacity of 10,520 kw. New 4800 hp Baldwin-Lima-Hamilton dual fuel engines and Electric Machinery generators are in foreground. Note Madison-Kipp lubricators. All engines are equipped with Briggs fuel oil filters. Four Worthington dual fuel units are in background.**

## List of Equipment

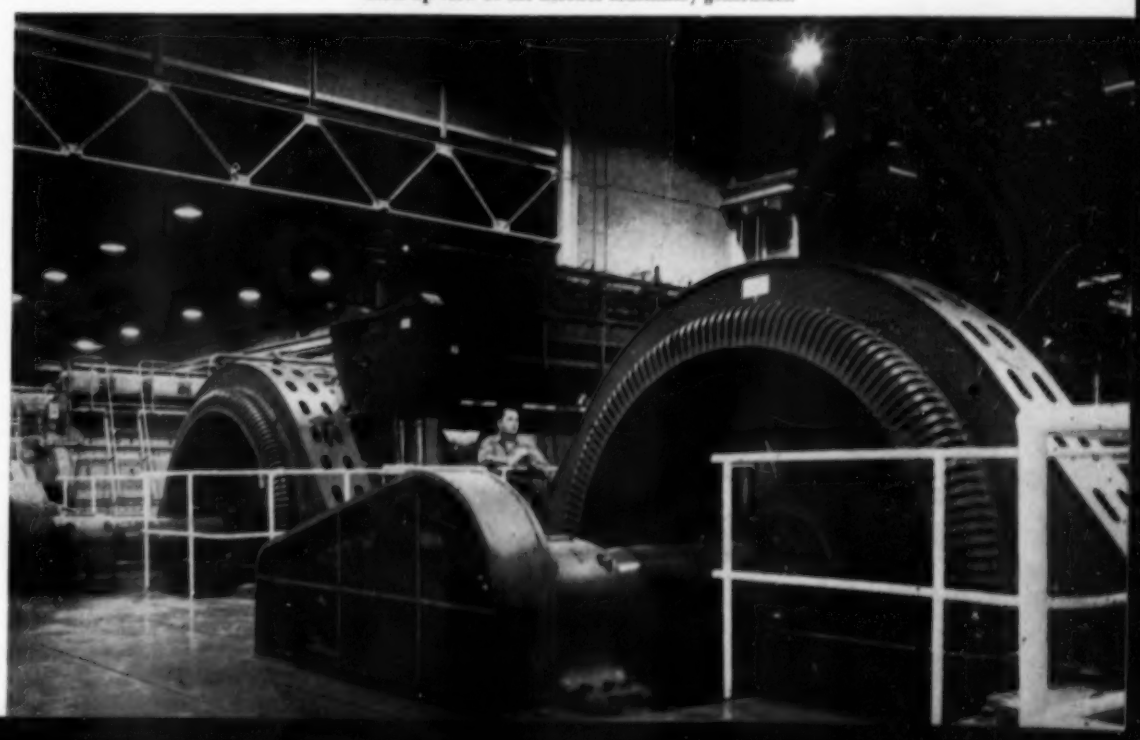
Engine—Baldwin-Lima-Hamilton, 4800 gross hp @ 257 rpm, bore 21½ in. stroke 27½ in.
Generator and exciter—Electric Machinery 3400kw.
Fuel oil booster pump—Worthington.
Fuel oil filter—Briggs.
Lube oil—Cities Service.
Lube oil cooler—Ross.
Batch lube oil purifier—Sharples.
Lube oil filter—U. S. Hoffman Orifice Type.
Lube oil strainer—Zurn.
Jacket water pumps—Peerless & Worthington.
Jacket water cooler—Ross.
Jacket water thermo-control valve—Fulton Sylphon.
Cooling tower—Marley.
Cooling water pumps—Fairbanks-Morse.
Intake air filter—American Air Filter.
Aquatowers—Marley.
Intake air aftercooler—Young.
Intake air vibration joint—Garlock.
Scavenging air blower—Roots-Connersville.
Exhaust silencer—Burgess-Manning.
Exhaust expansion joint—Badger.
Switchgear—General Electric.
Substation addition—Westinghouse.
Crane—10 ton Manning-Maxwell-Moore.
Thermometers & gauges—Ashcroft.
Air compressor—Quincy.
Gas meters—Roots-Connersville.
Gas regulators—Reynolds.
Pyrometer—Alnor.
Governor—Woodward.
Mechanical lubricators—Madison-Kipp.
Piston rings—C. Lee Cook.
Engine bearings—American Bearing Corp.

## LOAD GROWTH

### Central Kansas Electric Cooperative, Inc.

| Year | Net Plant Generation | Plant Demand | System Demand |
|---|---|---|---|
| 1948 | 5,688,780 kwh | 1610 kw | 1610 kw |
| 1949 | 8,716,330 | 2210 | 2210 |
| 1950 | 13,318,080 | 3250 | 3250 |
| 1951 | 17,795,400 | 3900 | 3900 |
| 1952 | 20,763,000 | 4195 | 4600 |
| 1953 | 25,359,000 | 4100 | 4800 |
| 1954 | 28,339,000 | 5800 | 5800 |

**Close-up view of the Electric Machinery generators.**



## Triple-Screw Towboat

A 72-foot craft recently rebuilt from the keel up by Frank and Jeane Seehorn of San Pedro is considered to be one of the most modern and completely equipped towing vessels operating in Southern California waters. The craft formerly known as the *Norene J* and originally built in 1918 has been rechristened the *Elizabeth*.

She is now a triple-screw boat powered by three General Motors marine diesels with a total rating of 575 horsepower. According to her owners she has excellent maneuverability and the three separate propulsion units provide an extra margin of safety. Her fuel tankage has been increased and the craft now has a cruising radius of 3200 miles.

Her center screw, 56-in. x 42-in., is turned by a GM 6-110 diesel through 4.5 to 1 reduction. Two GM 6-71 diesels serve as outboard wing engines turning 38-in. x 28-in. wheels through 3 to 1 reduction. A smaller GM diesel drives a 30 kw generator. The craft is operated by the H-10 Water Taxi Company of San Pedro, whose entire fleet of taxis was recently converted to diesel. The engine installations were made by the Crofton Diesel Engine Company of San Pedro.

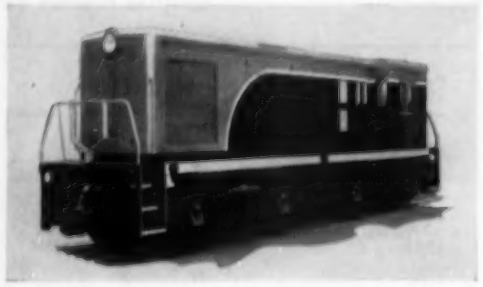
**The *Elizabeth*, triple-screw towing vessel, recently rebuilt by the H-10 Water Taxi Company of San Pedro.**

**The engine room of the *Elizabeth* where three GM Detroit diesels provide a total of 575 horsepower. The fourth GM diesel drives a 30 kw generator.**

## Two Special Steel Mill Locomotives

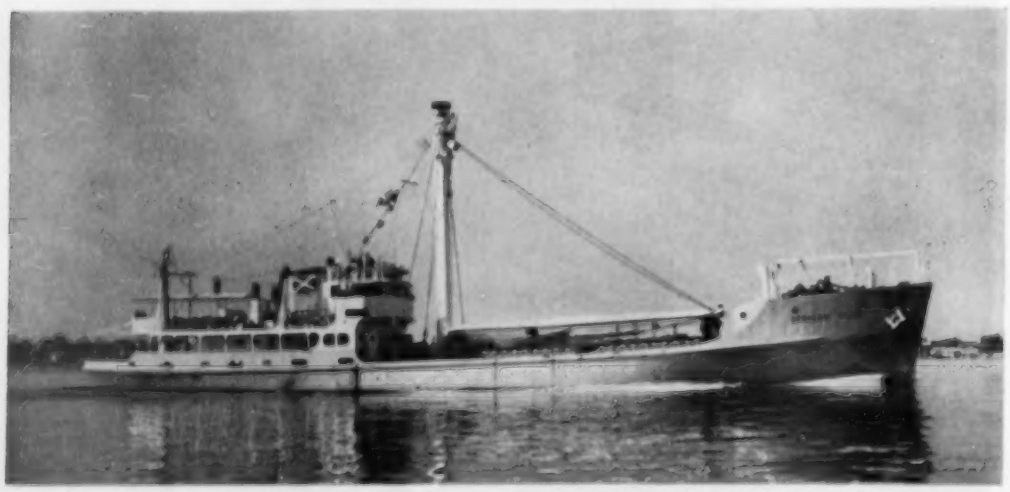
Two 100-ton, 0-4-4-0, diesel-electric locomotives of 36 in. gauge were delivered recently to the Inland Steel Co. by the builders, Davenport Besler Corp., Davenport, Iowa. Because of special conditions under which these locomotives will operate, they were designed by Davenport Besler engineers in collaboration with engineers, the repair department, and operating personnel of the Inland Steel Co. Among conditions necessitating special features are limited clearances and extreme dust. The air for both the electric generators and the traction motors will be filtered.

These locomotives were designed to a maximum overall width of 7 ft. 6 in., and a maximum overall height of 12 ft. Each is powered by one Caterpillar D-397 engine which develops 500 hp at 1200 rpm. The engine is directly connected to a General Electric GT-583A generator. A GMC-146 auxiliary excited generator which furnishes excitation for the main generator and current for controls and battery charging. Each truck is equipped with two General Electric 762-A1 motors. A truck-mounted drawgear, incorporating a rubber draft gear and type "E" automatic coupler, is used due to the low coupler height of 20¾ in. required for operation with the steel mill cars.



All piping and electrical wiring and conduit are under removable panels for ease in servicing and maintenance. Straight air brakes are supplied with a Westinghouse Air Brake two-stage, two-cylinder water-cooled compressor, belt-driven from the main generator. Tractive effort of these locomotives with 30% adhesion is 60,000 pounds at 2 mph; with 25% adhesion is 50,000 pounds at 2.6 mph.

## M/V *African Guide*



The coastal freighter, *African Guide*, has been sold by Farrell Lines to Mr. Teofilo Babun S. of Santiago de Cuba, one of the owners of the Babun Line. The *African Guide* was formerly operated by the Farrell Lines in the African coastal trade and has been replaced by *KPO*, a new vessel of shallower draft designed particularly for that purpose.

According to Sparkman & Stephens of New York who designed the new vessel and negotiated the sale of the *African Guide*, the latter will be used by the Babun Line to carry lumber, cement and general cargo between Central American, South American and West Indian ports. The ship is powered by two Cooper-Bessemer diesels. Her generators are 100 kw GM Cleveland Division units. A General Electric windlass, a Reliance steering motor and four Westinghouse cargo winches are included in her machinery equipment.

## Navy Boat Equipped To Measure Underwater Sounds

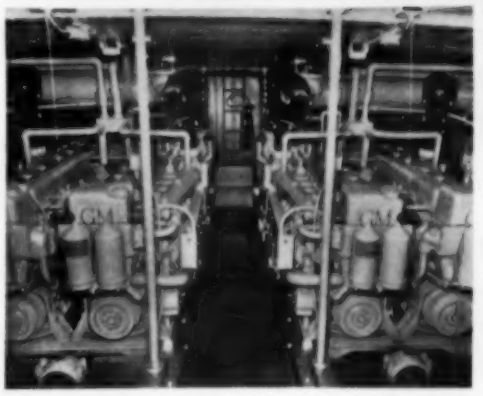
THE first of seven boats being built for the United States Navy for use in measuring underwater sounds has just been completed by the Blanchard Boat Company of Seattle, Washington.

With various electronic devices aboard and designed for utmost maneuverability the boats will be used in Navy experiments aimed at reducing undesirable sounds emanating from naval vessels.

Designated as the C-8013 the first craft of the series is 73 feet in length and according to the builders is capable of speeds up to 18.5 knots. Power is supplied by two General Motors Series "71" diesel quad units delivering 650 hp each at 1800 rpm.

The engines turn two 35-in. x 32-in. Columbian wheels through 1.75 to 1 reduction. Engines have hydraulic shifts and Mather controls. The craft is of wood construction, has a beam of 17 ft. and a draft of 4 ft. 3 in. The boats will be assigned to various naval activities upon completion and acceptance by the Navy.

**The 73-ft. C-8013 to be used by the U. S. Navy in measuring underwater sounds emanating from Naval vessels. The craft has been completed by the Blanchard Boat Company of Seattle, Washington.**



**The engine room of the C-8013 showing her two General Motors "quad" engines. The diesels turning 35-in. by 32-in. Columbian wheels through 1.75 to 1 reduction give the craft a speed of 18.5 knots.**

## All Purpose Lifter Vessel

The Pittsburgh District, U.S. Army Corps of Engineers, recently took delivery on an all-purpose lifter vessel built by Dravo Corp. Called the *Monallo No. 2*, it is a combination derrick boat, bucket dredge, and floating crane. It will be used in channel maintenance and lock and dam repair work on the inland waterways.

Power is provided by diesel-electric generators. The two engines are Model D375 Caterpillars, turning General Electric externally regulated 200 kw generators. G. E. also furnished motors for the main air compressor, and the main and spud hoists.

Auxiliary diesel generator sets were furnished by U.S. Motors Corp. and Electric Machinery Manufacturing Co. The main air compressor is Gardner-Denver. Air capstan reducer and coupling were made by DeLaval. The main hoist motor coupling is a Falk, size 12F, with a Roper fuel oil pump. is a Falk, size 12F, and the fuel oil pump is manufactured by Roper.

As a derrick, the vessel can lift 154 tons. Its lifting capacity as a full revolving crane is 65 tons at 46½ ft. radius. On dredging jobs, it can lift a bucket and contents weighing 19 tons at a radius of 90½ ft. The structural steel truss-type boom of the combination vessel is 87 ft. long.

# NEW DIESEL TUG "CHARLIE S"

A record for fast shipbuilding was set on August 16, 1954, when the GM Diesel tug *Charlie S.*, complete with machinery aboard, was launched at the yards of the builder and owner, Davie Shipbuilding Ltd. of Lauzon, Levis, Quebec, Canada.

Construction had started only six weeks previously, with the laying of the tug's keel. Increased tonnage and the great number of liners now using the Port of Quebec necessitated the addition of this modern diesel tug to the fleet of three already operated by Davie Shipbuilding in the Quebec district.

The *Charlie S.* is 94 ft. 4 in. long, has a molded breadth of 26 ft., depth of 13 ft. 6 in. The tug, which is of all-welded steel construction, is reinforced for working in ice and was built to the requirements of the Canadian Board of Steamship Inspection. The deckhouse, which houses the captain, second captain and cook, also contains the combined galley and messroom, equipped with electric range and refrigerator. Accommodation for three engineers and two seamen is arranged below deck in the forward part of the ship.

An electric windless is fitted forward and an electric capstan is located at the after end of the deckhouse abreast of a large towing hook. Metal lifeboats are provided on the port and starboard sides of the boatdeck and are handled by mechanical davits. The steering gear, which is of the electric-hydraulic type, can be operated from the wings, as well as from the wheelhouse.

Main propulsion is provided by a 12-cylinder, 2-cycle General Motors Model 278A Diesel engine, direct-connected to an airflex clutch-reverse-reduction gear unit, and rated 1200 shp at 750 rpm. The reverse-reduction gear has a ratio of 3.521:1, giving a speed of 212 rpm at the propeller shaft.

Control of the main propulsion machinery is handled either through the control station on the engine or through the control equipment located in the pilot house. The latter provides complete control of propulsion power, both ahead and astern, without the loss of time which would be involved if the pilot had to signal the engineer in the engine room when a change in direction or speed became necessary.

The unattached accessories for the main engine including starting air equipment, lubricating oil clarifiers and heat exchangers, also were furnished by General Motors. Arrangements are provided in the salt water circulating system to circulate the water in the system from the aft peak ballast tank in the event of ice blocking sea water inlets and discharges when working in extremely cold water. Ship's power and lighting is supplied by two 40 kw, 120-v dc diesel generator sets, arranged for parallel operation. The main switchboard is of the dead-front type and is complete with all equipment necessary for the control and protection of the electrical system. Pumping equipment is built in accordance with Canadian Board of Steamship Inspection regulations for this class of vessel and consists of a bilge pump, a general service and fire pump, a diesel oil transfer pump and a standby lubricating oil pump. Domestic pumps and pressure systems, one for salt water and one for fresh water, are also furnished.

Steam for heating crew's quarters and the interior of the vessel is supplied by an oil-fired boiler. This boiler has a capacity of 10 psig. Connections from the boiler are led to convectors in the crew's quarters and to unit heaters in the engine room, as well as a steam supply to sea valves for de-icing.

The tug was named *Charlie S.* as a tribute to Charlie Sauvageau, assistant general manager of Davie Shipbuilding Ltd. He has been associated with the company for almost forty years and has been responsible for the operation of the tugs for most of this period. Davie Shipbuilding is a subsidiary of Canada Steamship.

# WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **HAMISH FERGUSON**

**Hamish Ferguson received his training and early experience with the English Electric Company. Subsequently, he spent a number of years with a firm of diesel engine consultants, London, and in 1944 became secretary to the Diesel Engine Users Association. In 1953, he relinquished his appointment to devote his time to private consulting work connected with diesels and gas turbines.**

## HARLAND AND WOLFF PRESSURE-CHARGED, SINGLE-ACTING, OPPOSED-PISTON ENGINE

FOR many years the Harland-B. & W. two-stroke cycle, crosshead type, single-acting, opposed-piston engine has been widely and successfully applied to many kinds of vessels, including large tankers, refrigerated cargo liners, cargo ships, and tramps. It has also been installed, as a trunk engine, in cross-channel vessels and in power stations. For ship propulsion, the two most popular cylinder sizes are; 750 mm. (29.53 in.) bore, 2000 mm. (78.74 in.) combined stroke; and 620 mm. (24.41 in.) bore, 1870 mm. (76.62 in.) stroke. With normal air induction, and with cylinders varying in number from four to eight per engine, the range of powers covered by these two cylinder sizes extends from 3000 bhp to 9000 bhp per engine, continuous sea ratings.

On Harland & Wolff's test-bed in Belfast recently, the first of their large exhaust-turbine pressure-charged engines has been running extended trials.

This engine is a six-cylinder unit, 750 mm. bore, 2000 mm. combined stroke, built to the order of Messrs. Alfred Holt of Liverpool. To comply with the owner's requirements, the rating is very moderate accordingly, in service, the engine will deliver 800 bhp at 112 rpm. The trials were the culmination of a long program of development carried out by Harland & Wolff on the pressure-charging of diesel engines of both four-stroke and two-stroke types. As the result of pressure-charging the two-stroke engine the continuous service power has been increased by 30 to 35 per cent, as compared with normal induction.

The main advantages of the eccentric-type engine are compactness and simplicity. The crankshaft is short and stiff; there are as a rule no critical speeds to be avoided in the normal running range, or when maneuvering, or when running under reduced power. The general construction permits of all the components, e.g., crankshaft main bearings, connecting-rod bottom-end bearings, and so on, being of the simplest form. Reversing brakes, dampers, de-tuners, and other complications are not needed. Starting and reversing are positive.

**The Harland & Wolff pressure-charged, single-acting, opposed-piston engine on the company test-bed in Belfast. It is a six-cylinder unit with 750 mm bore and 2000 mm combined stroke delivering 800 bhp at 112 rpm, a moderate rating in accordance with the owner's requirements.**

The crankshaft is fully built, the forged steel crankpins and journal pieces being shrunk into crankwebs of cast steel. The eccentric sheaves and the balance weights are integrally cast with the crankwebs. The bedplate, frames and scavenge belt entablature are welded steel structures, stress-reliever before machining. The bedplate is of the shallow type, as specified by the owners, with the longitudinal members carried on a strong seating arrangement in the ship's double-bottom. The thrust block of Michell type is incorporated in the engine bedplate.

The cylinder liners are of tri-partite bolted construction, the top and bottom lengths being of vanadium cast iron, with a short cast steel piece inserted at mid-height to contain the two fuel valves, the starting valve and the safety valve. The cylinders are cooled by undistilled fresh water, circulating in a closed system. The main and exhaust pistons are of nodular cast iron, oil cooled. The exhaust piston yokes are of cast steel. The piston rods are secured to the main pistons by bolted flanges and to the crossheads by tapered ends having collar and nut. The crosshead pins are of large size and are flame-hardened. The ahead guide thrust is taken by the cast iron guide plates which are bolted to the engine frames; The astern guide thrust is taken by bars bolted to the ahead plates.

The connecting rod is of standard construction. The fuel pumps are of the gas-compression type, of Wilson & Kyle design and manufacture, all in ac-

*(. . . . please turn to next page . . . .)*

*(. . . continued from previous page . . .)*

cordance with the requirements of the owner's specifications. The fuel valves were also provided by the same makers.

In the pressure-charged engine, compared with the builders' normal induction type, there is little change in the design generally. There is, however, one notable difference. The chain-driven Roots displacement-type scavenge air blowers, which have always been characteristic of Harland-B. & W. two-stroke engines, have been completely dispensed with. Scavenge air for the pressure-charged engine is supplied by exhaust gas turbo-blowers. The air is drawn from the engine room into the blower through a combined filter and silencer; it is then delivered to the scavenge air manifold through a cooler, in which it is cooled to about 20°F above the cooling water temperature. The exhaust gas leaving the turbine is at approximately the same temperature as that from an engine having normal air induction; it is therefore available for raising steam in an exhaust gas boiler. On the six-cylinder engine there are two exhaust-turbo blowers, each blower supplying three cylinders. The turbo-blowers were manufactured by D. Napier & Son Ltd. of Acton, London and Liverpool. Details of their construction and operation will be given in next month's issue.

ENGINE DATA

| | |
|---|---|
| No. of Cylinders | 6 |
| Dia. of Cylinders | 750 mm. (29.53 in.) |
| Combined stroke | 2000 mm. (78.74 in.) |
| BHP | 8000 |
| RPM | 112 |
| Piston Speed | 1100 ft./min. |
| MIP | 100 psi |
| Fuel Consumption | 0.34 lb./bhp/hr. |
| Firing Pressure | 740 psi |
| Compression Pressure | 580 psi |
| Air Scavenging Pressure | 4.5 psi |
| Blower RPM | 5500 |

## Cooper-Bessemer Promotions

Robert F. Lay

Grant C. Woodard

The promotion of two men has been announced by Stanley E. Johnson, Sr., vice president and director of sales of The Cooper-Bessemer Corporation, Mount Vernon, Ohio. Robert F. Lay has been promoted to general sales manager of The Cooper-Bessemer Corporation. Grant C. Woodard has been appointed assistant general sales manager.

"The elevation of Mr. Lay to general sales manager highlights an extended period of distinguished service with the company," Mr. Johnson points out. Mr. Lay first became associated with Cooper-Bessemer in 1924 as a co-op student at the University of Cincinnati. He later joined the Baldwin Locomotive Company where he became assistant sales manager. In 1940 Mr. Lay went to the Elliott Company, Jeannette, Pennsylvania as sales engineer. He later became chief engineer of Elliott's Supercharging Division and production manager.

Returning to Cooper-Bessemer in 1946, Mr. Lay headed the Company's Stationary Application Engineering Section, a position he held until his promotion to chief engineer, Products Division, a year ago. Several months later he was appointed assistant general sales manager for all company products, including engine-driven and motor-driven compressors, gas engines, diesel engines and gas-diesel engines.

The promotion of Mr. Woodard to assistant general sales manager follows comprehensive experience in both engineering and sales. A graduate in mechanical engineering from Cornell University, Mr. Woodard received his basic training at the company's engineering facilities at the factory in Mount Vernon, Ohio. He then served as application engineer and later as sales engineer working from the home office on engine and compressor installations for pipe lines and refineries throughout Ohio, Kentucky, West Virginia, Tennessee and Michigan.

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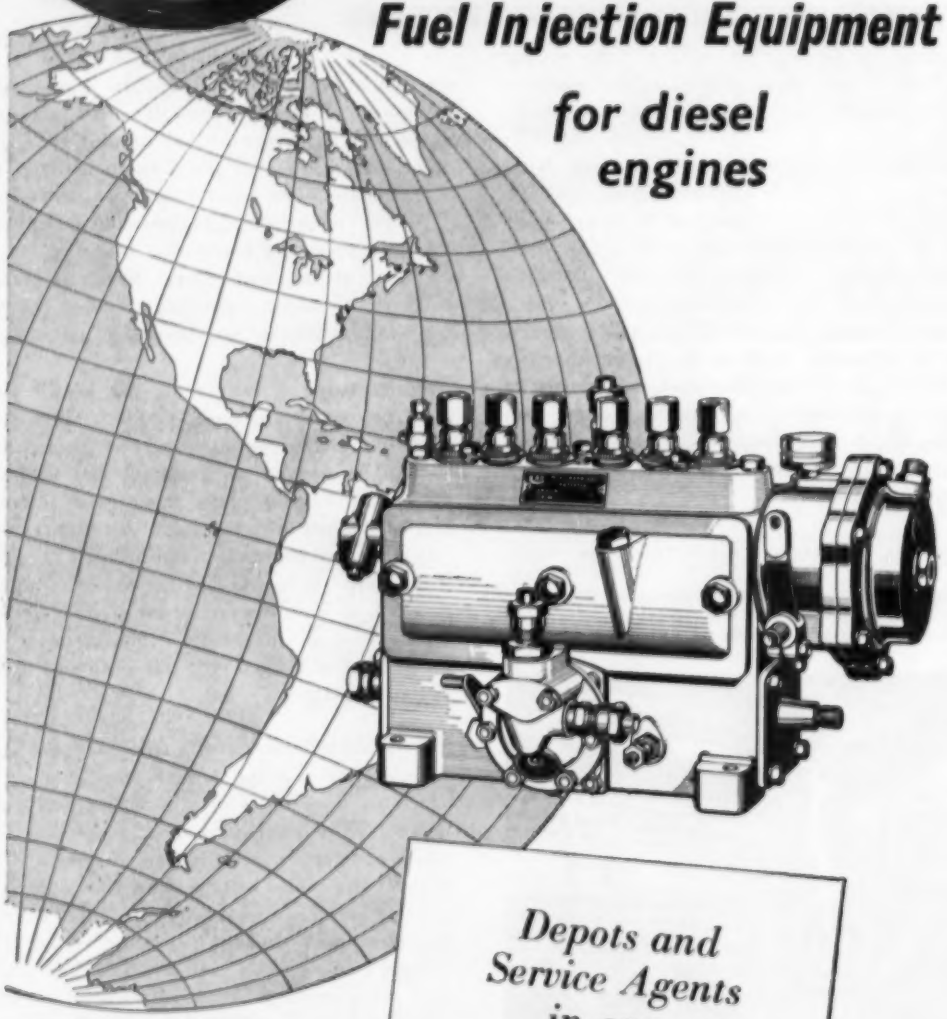

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Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO.

C.A.V. Fuel Injection and Electrical Equipment

## Engine Wear Meter

A new engine wear meter has been announced by the Gerin Corporation of Avon, N. J. It is a gauge permanently attached to any engine and claims to warn the operator when there is fuel dilution, water or antifreeze leakage, running on dead filters, wrong grade make-up oil and the like. The meter responds to any increase or decrease in viscosity. Viscosity is said to be the best and most sensitive indicator for changes in the crankcase oil which the operator must guard against to avoid rapid wear of piston rings, cylinder bores, timing gears and other parts that otherwise do not last as long as the rest of the engine.

The maker says this is not a new idea but unlike previous instruments this meter does not respond to the normal thickening or thinning of the oil incidental to varying operating temperatures. Hot or cold, the indicating hand points only to true and permanent changes. Accuracy within 1% is claimed and therefore the meter does not show the oil up a little on one reading and down the next. It is also remarkably sturdy and the internal movement does not vibrate when the instrument is subjected to vibration and shock, as on truck and locomotive engines. When the engine is worn out the meter can be transferred to the replacement unit. Installation takes 30 minutes on any engine.

A sixteen page Booklet 800 titled "Engine Insurance" contains much interesting information on lengthening the life of engines and keeping away from periods of operation during which excessive wear occurs. The booklet is distributed free by the Gerin Corporation, Avon, N. J.

## Four Sales Appointments

Dale W. Blanton

Robert A. Thompson

George Heuer

Austin B. Crouchley

Arthur W. Ostrander, general sales manager of Enterprise Engine & Machinery Co., subsidiary of General Metals Corporation, San Francisco, announced four new appointments in the sales organization. Dale W. Blanton becomes manager of contract engineering. Robert A. Thompson is named senior contract engineer; and George Heuer, contract engineer. Austin B. Crouchley becomes sales engineer working out of the New York office.

Mr. Blanton has been with Enterprise since 1950. Prior to which he was a sales engineer for Atlas Imperial Diesel Engine Co. He started with the latter company as a sales trainee in 1940 and left the firm to serve in the Navy during the war. Mr. Thompson has been connected with Enterprise since 1937. Starting in the blueprint department, he has served as draftsman, detailer, layout man, and design and project engineer. During the war he was on special assignment lecturing for the U. S. Maritime Service and was in charge of the Navy section of the engineering department. Mr. Heuer has been with Enterprise for three years as a research and development engineer, specializing in turbocharging of diesel, dual fuel, and spark ignition engines. A graduate of the University of California in chemical engineering, he served five years with the Navy during World War II in operation and maintenance on vessels ranging from subchasers to tankers in the Atlantic, Pacific, and Caribbean. Mr. Crouchley comes to Enterprise from Chicago Pneumatic Tool Co. He was a sales engineer for this firm working out of Chicago in the mid-west territory. His work with Enterprise as sales engineer will be in the New York area.


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- **SINGLE BOLT CLOSURE**—Ingeniously designed Clamping Ring utilizes Single Bolt Closure for quick, easy Pack Replacement.
- **POSITIVE SEALING GASKET**—Long lasting "O" ring type gasket assures leak-proof lid closure at all operating pressures.
- **NEW TYPE INTERNAL DESIGN AND CONSTRUCTION**—Provides multiple seal to eliminate the possibility of oil by-passing the Luber-finer pack.
- **DUAL SAFETY VALVES**—Prevents oil drain-back, assuring exact crank case oil level reading at all times, stops oil from circulating through unit if lines are reversed or if Luber-finer is otherwise improperly installed.
- **ONE-PIECE EXTRUDED STEEL HOUSING**—Plus rugged mounting brackets insures durability and long, trouble-free operation.
- **TIME-TESTED PATENTED FILTERING PROCESS**—Only in genuine LUBER-FINER PACKS—the exclusive patented filtering process proved by millions of satisfied users the world over.

*FOR COMPLETE INFORMATION WRITE DEPT. 38*

LUBER-FINER, INC., 2514 So. Grand Avenue, Los Angeles 7

## Florida Diesel News

*By* **Ed Dennis**

FOR PAN AMERICAN World Airways, Patrick Air Force Base, Cocoa, Fla.: a model 45 Fairbanks-Morse diesel generating set rated 5¼ hp with a 3 kw generator for use at the guided missile base.

AT DAYTONA BEACH, Mar Seafood Specialty Inc. took delivery of their newly launched Diesel Engine Sales shrimp trawler *Grand-Mar* powered with a D326 Caterpillar diesel rated 170 hp at 2000 rpm.

IN A REX asphalt road paver for Belcher Oil Co. of Miami, a General Motors 3-71 diesel engine.

THREE NORDBERG diesels model FS 13x16½ each rated at 1240 hp to supply power for 3 Nordberg vertical axial flow type pumps rated at 438,750 gpm each at 83 ft. static head, for installation in pumping station #6 on the Hillsboro Canal in Palm Beach County 24 miles southeast of Lake Okeechobee.

CUMMINS DIESEL Engines of Florida installed a model HRBI Cummins diesel engine rated at 110 hp at 1800 rpm in a road scraper for the Perrine Construction Co. of Perrine.

FOR THE HAYTIAN Tractor & Equipment Co. at Port au Prince a #12 Caterpillar road scraper. A D8 tractor was delivered to St. Marks, Haiti and Wigs Ltd. of Inagua, Bahama Islands.

FROM FLORIDA Diesel Engine Sales, GM Corp., Miami, a General Motors diesel of the 71 series to be used as a spare engine for a Euclid bottom dump; for Hooper Construction Co. of Coral Gables.

THE BUDA CO. announces the appointment of J. Frank Knorr-Miami, distributor for the Buda marine diesel engines and Peninsular Armature Works-Miami, for the Buda diesel generating units; for South Florida.

AT OJUS, the Plantation Cold Storage received a model D326 Caterpillar rated at 170 hp max. with a 90 kw Columbia generator.

TWO A. G. SCHOONMAKER CO. diesel generating units installed at Lake Worth; installation included 2 GM V16-278-A engines and Elliott 1375 kva generators, Harrison oil coolers and Young outdoor radiators.

FROM J. FRANK KNORR Inc., for use on the Howard Backus tugboat, a Nordberg 4FS diesel generating set with a Win-Power 10 kw generator.

GENERAL MOTORS diesel engines power the two newly launched 53 ft. sightseeing boats, *Commodore I* and *II* for Saul Sabad of Miami Beach, built by Diesel Engine Sales of St. Augustine, each have a GM 6-71 diesel and 3:1 hydraulic reduction gears, driving a 40x26 4-blade Columbian propeller. Also included were Jabsco pumps and Maxim silencers.

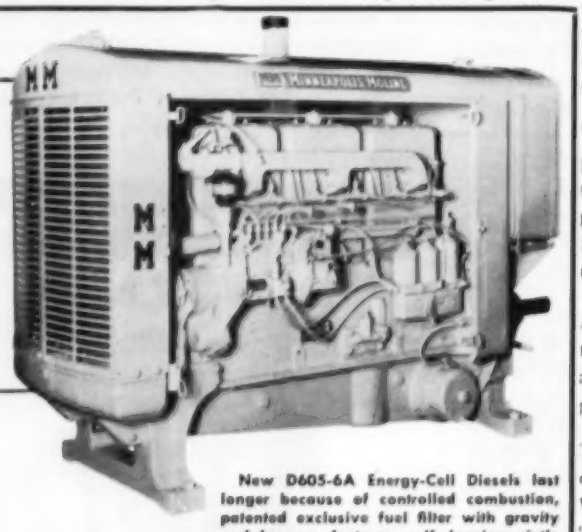
### Municipal Utilities Association

The Spring meeting of the Municipal Utilities Association will be held in Hillsdale on April 13, 14, and 15. The program features another forum on diesel operation and maintenance, scheduled for the morning of the 14th. A panel discussion will open the session. R. L. Gregory, Hillsdale, a regular contributor to DIESEL PROGRESS, will serve as moderator. His panel will consist of J. Bryan Sims, Grand Haven; Thomas Moore, Lowell; C. Moser, Marquette; E. Lockwood, Hershy; and representatives of Nordberg Mfg. Co., Milwaukee, and of Baldwin-Lima-Hamilton Corp., Hamilton, Ohio. This is the first time that the Diesel Manufacturers Association has been invited to have representation on one of the Michigan panels. Guests from Ohio and Indiana municipal plants will be in attendance.


# WHY IT PAYS TO OWN INDUSTRIAL DIESELS WITH REMOVABLE CYLINDER BLOCKS AND HEADS

New MM diesels were developed with *energy-cells* to make them last longer, do more and go farther with less down-time and maintenance.

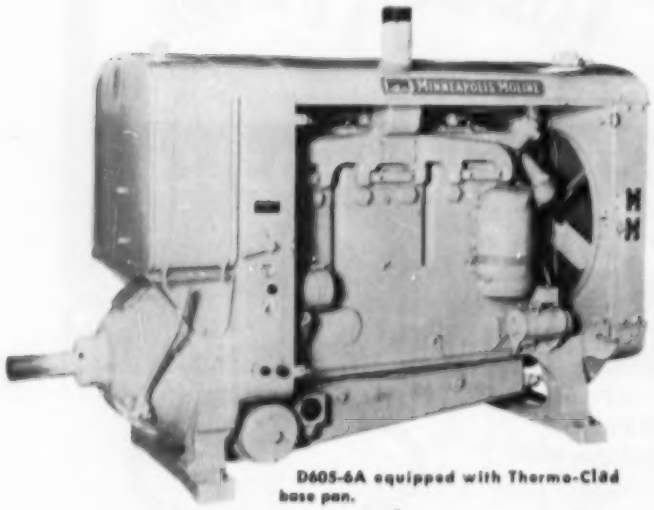
To provide owners with lower cost maintenance when necessary MM diesels are the most advanced and soundly engineered because the cylinder blocks are cast in pairs separate from the crankcase.



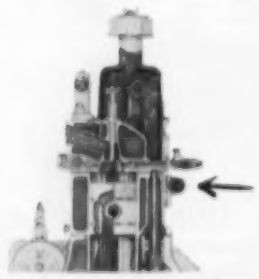

**New D605-6A Energy-Cell Diesels last longer because of controlled combustion, patented exclusive fuel filter with gravity and by-pass features, self-cleaning pintle type nozzle, directed cooling of area around combustion chambers.**

## YOU GET THESE ADDED ADVANTAGES . . .

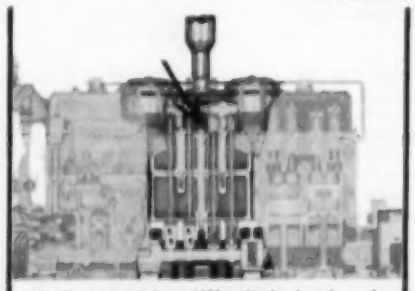
1. Ease of maintenance and low cost emergency service because paired cylinder blocks, pistons, and rods can be removed as a unit by one man.
2. Prolonged time between overhauls by use of close-grain cast iron that provides best cylinder lubrication for reduced wear.
3. Less service due to minimum distortion as MM cylinder heads, cylinder blocks and crankcase are virtually strapped together by full-length steel studs anchored in the main bearing bulkheads. (Transmits combustion pressure to heavy crankcase that has extra depth below center line of crankshaft.)
4. Efficient operation obtained by uniform cylinder expansion . . . the result of controlled cooling and long oil-cooled cylinder wall skirts below ring travel area.
5. "New engine" performance at extremely nominal cost can be obtained right in the field without special tools using factory matched cylinder blocks, pistons, pins, and rings. (Blocks are dowelled to crankcase to assure bore is square with crankshaft and pistons are precision fit to bore . . . equivalent to a factory job.)
6. Lower initial cost stems from high production parts by casting cylinder blocks in pairs separate from the crankcase.



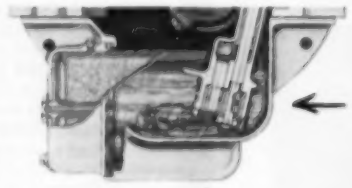

**D605-6A equipped with Thermo-Clad base pan.**



**1. Cylinder head and block assembly shows coolant entrance at hottest point first and extra long skirt wall construction.**



**2. Close-up of how MM cylinder heads and blocks and crankcase are tied into a single rigid unit with long studs.**



**3. A D283 feature is extra large oil filter enclosed in base pan, floating-screen oil pump intake, and pump located in bottom of base pan.**

**Optional Thermo-clad water-blanketed base pans for all units also have oil filter included to give more effective filtering.**

INDUSTRIAL
MINNEAPOLIS MOLINE
MM
MODERN MACHINERY
DIVISION

**MINNEAPOLIS-MOLINE**

**MINNEAPOLIS 1, MINNESOTA**

## Briggs Filtration Representatives

The Briggs Filtration Company of Washington, D. C. announces the following appointments and promotions of industrial sales representatives for New York State, Northwestern Pennsylvania, Northern New Jersey and Eastern Connecticut, and Illinois. Mr. Frederic B. Town, former sales representative for Cummins Diesel Sales Corp. in New Jersey and New York City, has been appointed Briggs district manager, handling the Manhattan area and all marine applications in the New York City area, with headquarters at 135 Liberty Street, New York 6, New York. Telephone: Barclay 7-7699. Mr. Town will replace Mr. S. Bruce Somervell, long time Briggs distributor, who is retiring.

Mr. Frank Lewis will represent Briggs in Western New York and Northwestern Pennsylvania, including Buffalo, New York and Erie, Pennsylvania, with headquarters at 1807 Elmwood Avenue, Buffalo 7, N.Y. Telephone: Riverside 4517.

Mr. J. S. Middleton has been on Bowser, Inc. sales force for several years, and will now handle Briggs industrial sales in central New York State, with headquarters at 120 Downing Road, DeWitt, New York. Telephone: 72-8619.

Mr. Louis P. Grasso will serve Northeastern New York State as Briggs sales representative, with headquarters at the Albany office of Bowser, Inc., where he has been on the Bowser sales force for several years.

Mr. H. D. Urdanoff will handle Northern New Jersey and Eastern Connecticut, except marine applications, with headquarters at Bowser, Inc., 420 Lexington Avenue, New York 17, New York. Telephone Lexington 2-5840. Mr. Urdanoff has been on the Bowser sales force for several years.

These representatives will handle products of both The Briggs Filtration Company and Bowser, Inc., with facilities in research and engineering available through both companies.

Mr. L. E. Foran becomes industrial sales representative for the Chicago area, with headquarters at 1335 West Randolph Street, Chicago 7, Illinois. Telephone: Haymarket 1-7400. Mr. Foran has had several years experience in industrial sales having spent considerable time as sales engineer for one of Briggs former distributors.

## Weatherhead Catalog

A new composite industrial products catalog has just been issued by The Weatherhead Company, Cleveland, Ohio. Known as the Weatherhead "Yellow Book," this informative literature has been furnished to authorized Weatherhead industrial distributors and is also available to original equipment manufacturers. The "Yellow Book" is one of the most complete and comprehensive industrial hose and fittings catalogs ever compiled by a manufacturer. It contains 132 pages of valuable information for designers of hydraulic and pneumatic control systems. Arranged for quick reference, its tabbed pages indicate separate sections covering Brass Tube Fittings, Drain and Shut-off Cocks, SAE 37° Flare (JIC) Fittings, Ermeto Steel and Stainless Steel Fittings, Bulk Hose and Reusable Ends, and Hose Assemblies (with reusable or permanently-attached ends).

The "Technical Data" section includes pressure tables, tube bending instructions, correct procedures for making hose assemblies, hose end hex sizes, tubing safety factors, tube wall thickness tables, and other useful data. A section covering service tools and equipment is also included. The "Yellow Book" is available from The Weatherhead Company, 300 East 131st Street, Cleveland 8, Ohio, or through Weatherhead industrial distributors located in principal cities from coast to coast.

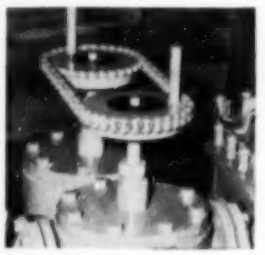
# Random Thoughts from a Filter Engineer

*by Harold R. Sobeck*

- **GEORGE COULDN'T DO IT SO WE DID!**
- **PIGGY-BACK SOLUTION TO A SPACE PROBLEM**
- **GOOD OLD DAYS EVEN SOUNDED DIFFERENT**

### GEORGE COULDN'T DO IT SO WE DID!

Sometimes a manufacturer has to step into another field to get the quality he wants in his product. So it was with our engineering staff when it stepped into the highly specialized valve-making field. We needed a special valve for our large duplex lube oil filter. But none of the valve manufacturers we knew were able to come up with one that would give satisfactory performance at a reasonable price. So we designed and made one of our own. We tried to let George do it, but he couldn't. The valve our engineering department designed shuts easily, evenly, with no leaks. And since it costs much less, we're able to pass the savings along to you. We don't intend to go into the valve-making business but we are glad we have engineers of our own who are versatile enough to step into a specialized field and find a solution that many specialists couldn't.



*New Valve for Duplex Lube Oil Filter*

### PIGGY-BACK SOLUTION TO A SPACE PROBLEM

More and more railroads are switching to our oil bath filters for diesel locomotives. And with gratifying results. In a year's time, they can save the entire cost of the filter. But some types of locomotives couldn't be changed over. They just didn't have the space to allow for the use of an Air-Maze oil bath filter. Switchers, for example.

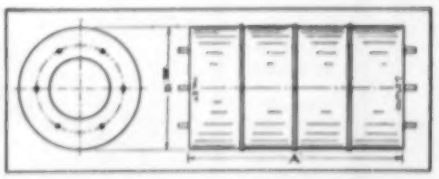
*Typical Piggy-Back Filter Installation*

That's when our engineers came up with a simple but ingenious arrangement of filters that saved the day. By putting one filter on top of the other, piggy-back style (see picture), a large air flow can be handled in a small space. So today even switchers can take full advantage of the benefits of Air-Maze oil bath filters.

### GOOD OLD DAYS EVEN SOUNDED DIFFERENT

Today's engines even *sound* different than those of a few years ago. And that means different problems for the manufacturer of silencers. For example, modern turbo and super-charged engines draw in such a large volume of air at such high speeds that high frequency noise results. Ordinary silencers can't dampen this noise.

*Air-Maze Inline Silencer used on Lobe Type Blowers*



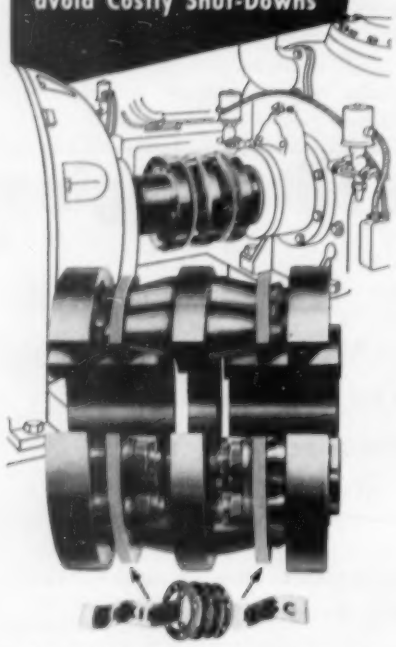
Our engineers met the problem by designing a new kind of silencer. Besides an acoustical chamber for dampening low and medium frequency noise, it has special materials that absorb high frequency noise as well. And this silencer can be used in-the-line, with or without oil-bath and oil-wetted filters. The Air-Maze Corporation, 25000 Miles Avenue, Cleveland 28, Ohio.

AIR-MAZE

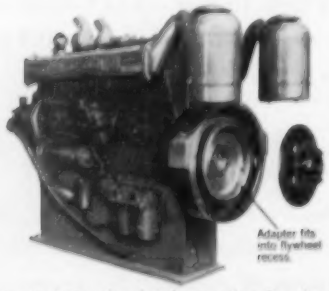
*The Filter Engineers*

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



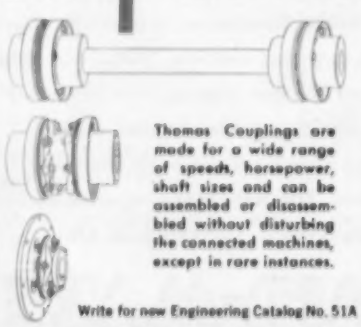
Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.




Typical Flywheel Adapter Application

DISTINCTIVE ADVANTAGES

| FACTS | EXPLANATION |
|---|---|
| NO MAINTENANCE | Requires No Attention. Visual Inspection While Operating. |
| NO LUBRICATION | No Wearing Parts. Freedom from Shut-downs. |
| NO BACKLASH | No Loose Parts. All Parts Solidly Bolted. |
| CAN NOT "CREATE" THRUST | Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement. |
| PERMANENT TORSIONAL CHARACTERISTICS | Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained. |



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

The new 23-yard B Tournapull offers ten gear ratios allowing selection of working speeds best suited to underfoot conditions. Power is by either a Cummins or GM diesel.

## New Tournapull Announced

ANNOUNCED by LeTourneau-Westinghouse Co. as the first new machine completely designed and built by the new company is the B Tournapull—a 23-yard single-engine, self-propelled scraper. Developed by the company's new engineering and research staff, it is a machine that is brand new from the ground up. Struck capacity is 18 yards, heaped capacity without sideboards, 23 yards. The overall length is 40 ft. 6 in. It is 11 ft. 8 in. wide and 12 ft. 7 in. in height.

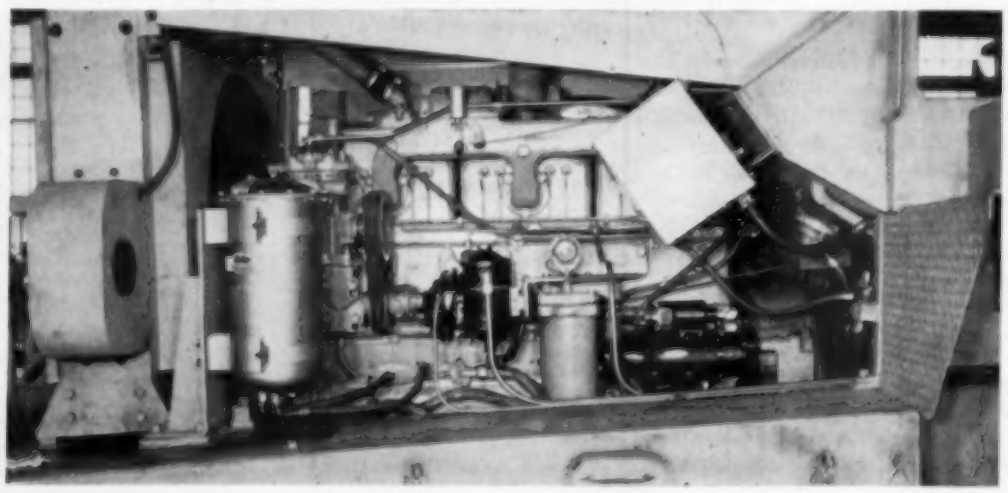
Powered by a 293 hp diesel, either Cummins or General Motors, the unit offers 10 gear ratios, ranging from 2.4 to 28.4 mph. This, the manufacturer points out, allows selection of working speeds best suited to underfoot conditions. Its low gear matches pusher speed and gives full lugging power for pulling through soft going. It is designed for fast shifting so higher hauling speeds can be reached quickly. Other features mentioned by the manufacturer include the easy loading characteristics of its new scraper design, deflector plate, high apron lift, wheels inside the cutting edge of the scraper blade, power-steer steering wheel and full-shift fuel supply.

The new machine has been engineered for quick and easy replacement of component assemblies, with emphasis on accessibility. According to LeTourneau-Westinghouse, all major assemblies such as transmission, clutch, final drive and differential can be lifted from the machine without handling other components. The release on the scraper allows gravity drop of the bowl, with the machine's electric controls always available for hoisting. This feature, it is pointed out, allows the operator to "pump" loads, recognized as a big help in working effectively in sand and other loose materials. "Pumping" also keeps material boiling for big loads. Other aids to achieving boiling action while loading are the deflector plate at the rear of the bowl, and the scraper's curved apron, which lifts 6 ft. 6 in. to permit free injection of any material.

Electric control equipment is basic to all LeTourneau-Westinghouse equipment. Controls are few in number. A lever to the right of the steering wheel raises and lowers the bowl. Fingertip controls operate apron and tailgate action. Other levers are shift lever, transfer case and hand throttle. Floor pedals operate the accelerator, clutch and brake. Starting is by dashboard pushbutton.

The unit can turn around non-stop in a space 35 ft. wide. Four-wheel air brakes (7536 sq. in. of total brake surface) and power-steer provide safety on steep grades. The transmission can be dropped in an hour without pulling the engine. The transfer case can be taken off in a few minutes by removing only a few bolts. Bolt sizes are held to a minimum. Drain and fill plugs can be reached easily, and the number of lubrication points and type of lubricants are reduced to the lowest practical limits. Tires used all around are

A view of the engine compartment of the B Tournapull with the Cummins NHRBIS 600, 293 hp at 2000 rpm engine. Note the Luber-Finer filter at left, the Nugent in center. The power plant has a Delco-Remy starter and Stratoflex flexible hose lines.



27x33, 30-ply. Tires and wheels are interchangeable between prime mover and scraper.

Interchangeable with the scraper for use with the B Tournapull is a 35-ton rear dump. Carrying 35 tons, it is rated at 23 yards struck and 27 yards on a 2-to-1 heap without sideboards. Dimensions of the bowl are: 17 ft. 8 in. long; 19 ft. 2 in. wide; maximum depth, 7 ft. 6 in. The body raises to vertical position at the touch of a dashboard switch.

The edge of the bowl swings behind and below the rear wheels so that rocks cannot roll forward to lodge against the wheels. This also prevents material from piling up under the rear end.

## Export Appointments

Max Knopp

Arthur W. Ostrander, general sales manager of Enterprise Engine & Machinery Co., subsidiary of General Metals Corporation of San Francisco, announced the appointment of Max Knopp to the position of export manager. Mr. Knopp makes his headquarters in the Enterprise New York office. Mr. Knopp has a broad background in engineering, sales, specialized heavy industrial equipment, and engine export work. A native of Brno, Czechoslovakia, he obtained degrees in both mechanical and electrical engineering before entering the service of various major Czechoslovakian manufacturers of heavy-duty machinery; such as, the Skodaworks, CKD—Bohemian-Moravian Engineering Works, and Mannesmann at Prague.

Ali Kefeli

Subsequent to his assuming his duties, Max Knopp announced the granting of the Turkish franchise for the distribution of all Enterprise products: engines, industrial oil burners, and process machinery to Ali Kefeli, owner and manager of Kefeli A. Riza Co., Istanbul. Ali Kefeli was at the San Francisco plant during January. He is well acquainted with Enterprise engines, having participated in the sale of a DSG-18, rated 600 bhp at 420 rpm, to the city of Samsun, Turkey. He reports this installation has been in operation on a basic 16-hour day continuously for six years. The first overhaul at the end of the fifth year found the engine in good working condition requiring replacement for only a few normal wearing parts.

## Receives Foreign Order

Baldwin-Lima-Hamilton Corp., Philadelphia, Pa., has received an order from Usine Gustav Boel, La Louviere, Belgium, for four 65 ton diesel electric industrial locomotives. Each unit will be powered by two Hercules 300 bhp, 6-cylinder diesel engines, and will develop a tractive effort of 32,500 pounds at 25% adhesion.


SPECIFY

ADECO

FUEL INJECTION EQUIPMENT

FOR DEPENDABLE PERFORMANCE

ADECO

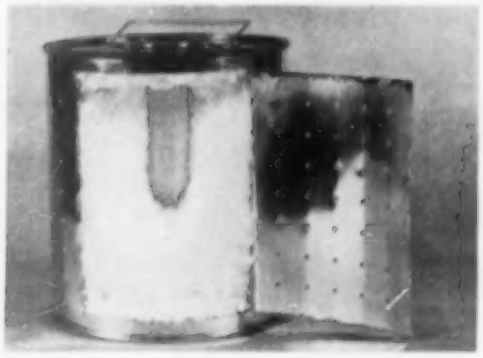
Adeco Products, Incorporated

CHICAGO 40, ILLINOIS

•

MASTER CRAFTSMEN
OF FINE FUEL INJECTION EQUIPMENT

## New Oil Filtering Medium



W. G. B. Oil Clarifier, Inc., manufacturer of oil filters and oil filter replacement cartridges, Kingston, New York, announces a new oil filtering medium known as W.G.B. White Super Clar-O-fex. This material is snow white in appearance and exceptionally light in weight. It reportedly has an unusually high cleansing capacity with an inherent ability to maintain a proper flow of oil and to maintain its stability without compressing or matting down under pressure in the process of collecting insolubles, for a longer period of time. White Super Clar-O-fex will in no way affect the additives or detergents put in the oil by the refiner.

W.G.B. White Super Clar-O-fex will be used in W.G.B. replacement cartridges for both W.G.B. Clarifiers and other filters requiring sock type cartridges. Construction of the latter type is entirely new and different from those manufactured by W.G.B. in the past. W.G.B. also offers White Super Clar-O-fex in its line of can type replacement cartridges for other makes of filters. Further details can be obtained by writing the manufacturer at Kingston, N. Y.


ROCKFORD

FOR HAND-LEVER OPERATION

EASY OPERATION
HIGH TORQUE
POSITIVE ENGAGEMENT
LARGE DRIVING AREA
SMOOTH RUNNING
INFREQUENT ADJUSTMENT
MINIMUM INERTIA

* Anti-friction ROLLER CAMS — an exclusive feature — make ROCKFORD Over-Center CLUTCH operation extremely easy. A light pressure, lever-controlled, toggle-joint arrangement moves the high point of the cams "over center". Let ROCKFORD engineers show you how this and other ROCKFORD Over Center CLUTCH advantages will benefit your product.

**Send for This Handy Bulletin**

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
▲ 1321 18th. Avenue, Rockford, Illinois, U.S.A. ▲

CLUTCHES


## F-M Railroad Product Sales

William G. Herzig

V. H. Peterson, vice president — Railroad Sales, Fairbanks Morse & Co., has announced the appointment of William G. Herzig as manager of the Railroad Product Sales Department, Railroad Division, with offices at the company's headquarters at 600 South Michigan Avenue, Chicago. He succeeds J. F. Marquitz who is retiring.

Mr. Herzig has been with the company for nine years in various sales capacities, the last one being manager of Railroad Sales of the Chicago Branch.

## Tubular Heater For Diesels

Cross section of diesel-engine combustion chamber is pictured here, showing the General Electric tubular heater for starting in sub-zero weather. The tubular heater, or glow plug, is shown extending into the chamber through a tapped hole in the right hand side. When the engine is cranked, power from batteries is transmitted to the heater, which reaches a temperature of 1800 degrees F., according to GE engineers. Product of several years of research at the department's Pittsfield, Mass., plant, the tubular heater enables an operator to start a diesel engine under all weather conditions, according to GE engineers. The new product was developed by GE for the Caterpillar Tractor Company of Peoria, Ill., whose engineers subjected it to extensive hot and cold tests over a period of several years.

A component part of the diesel engine, the tubular heater is about the size of an ordinary lead pencil and is installed into the engine's precombustion chamber. When the engine is cranked, power from the batteries is transmitted to the heater which, in 30 seconds, reaches a temperature of 1800 degrees F., the engineers said. The tests conducted by the Caterpillar Company have established the tubular heater as a reliable electrical starting system. The records show there was not a single case of engine starting failure following pre-heating by the GE device, and batteries maintained full charge in spite of temperature or the duration of heating time.

## Mid-Continent Diesel News

*By* **Jack F. Cozier**

GRANNELL Drilling Co., Casper, Wyoming, has purchased two model 124 Murphy diesels for repowering a Unit Rig U-15 draw-works (compounded with pump), operating in Montana. The sale was handled by Hall Perry Machinery Co., Butte, Montana.

GLOBE Construction Co., Wichita, Kansas, has purchased two Hough payloaders powered by two GM 3-71 diesel engines for general construction work. The two units were sold by Diesel Equipment Co., Wichita, Kansas.

JENNINGS Engine Supply Co., Oklahoma City, Oklahoma, has just bought one 8PC-2505 Buda gas engine for drilling service in Southern Oklahoma from Buda Engine & Equipment Co., Tulsa, Oklahoma.

STEWART Sand & Material Co., Kansas City, Mo., has just purchased a Murphy 122 diesel powering a Hetherington & Burner sand pump installation on their sand barge. The unit was sold by Funkhouser Machinery Co., Kansas City.

BATEMAN Drilling Co., New Orleans, has purchased a diesel-electric rig powered by an Alco 251-800 hp diesel engine.

MISSISSIPPI Lime Co., Ste. Genevieve, Mo., has repowered a Teaco rear-dump truck with a Buda 6DA-779 diesel purchased from Arrow Engine Sales & Service, Inc., Saint Louis, Mo.

LANGLEY Construction Co., Tulsa, Okla., has purchased a Unit 614 crane powered by a 2-71 GM diesel engine from Midwestern Engine & Equipment Co., Tulsa, Okla.

S. A. BERWICK Drilling Co., Great Bend, Kans., twin 12-103 GM diesel engines, for a rotary rig, from Diesel Equipment Co., Wichita, Kans.

GEORGE BENNETT Contractor, Kansas City, Kans., repowered a Northwest model 80-D shovel with a Murphy model 21 diesel engine from Funkhouser Machinery Co., Kansas City, Mo.

FREEMAN Coal Mining Corp., Johnson City, Ill., repowered a Barber-Greene loader with a Buda HP-217 engine from Arrow Engine Sales & Service, Inc.

G-M-R OIL CO., Wichita, Kans., in an oil field application purchased a 12-103 GM diesel engine from Diesel Equipment Co., Inc., Wichita, Kans.

KNIGHT Mfg. & Supply Co., Tulsa, Okla., purchased six 6MO-970 Buda gas engines for use in gas compressor service in Southern Oklahoma. The purchase was made from Buda Engine & Equipment Co., Tulsa, Okla.

ASHLEY'S INC., El Paso, Tex., has in operation since 1952 a Kenworth, cab-over-engine, truck powered by a Cummins model NHB-600 diesel. The truck has logged over 150,000 miles of dependable service.

KRAUS Plow Corp., Hutchison, Kans., just purchased a Buda 6DA-273 diesel engine to power a Forage farm harvester from Buda Engine & Equipment Co., Tulsa, Okla.

JONES & LAUGHLIN Supply Co., Tulsa, Okla., has purchased a GM 8103 diesel engine to power a mud-pump on a rig. The engine was sold by Diesel Power Co., Tulsa, Okla.

G-M-R OIL CO., Wichita, Kans., is repowering a Biderman 6x6 oil field truck with a GM 6-71 diesel engine purchased from Diesel Equipment Co., Wichita, Kan.

CLARKSON Construction Co., Kansas City, Mo., has purchased a Northwest model 25 crane powered with a Murphy model 11 diesel engine from Funkhouser Machinery Co., Kansas City, Mo.

McCLAIN Construction Co., Allerton, Iowa., repowered a Bucyrus-Erie with a Buda K-428 engine sold by Arrow Engine Sales & Service, Inc., St. Louis.

L. C. SMITHERMAN Drilling Co., Augusta, Kans., purchased a 12-103 twin GM diesel engine on a Brewster draw works from Diesel Equipment Co., Inc., Wichita, Kans.

REED DRILLING Co., Tulsa, Okla., has purchased two LeRoi diesel engines model H-844 to power a Twin-Disc torque converter. The sale was made by Midwestern Engine & Equipment Co., Tulsa, Okla.

TORSON Construction Co., Kansas City, Mo, purchased a Northwest model 41 pull-shovel powered by a model 12 Murphy diesel from the Funkhouser Machinery Co.

VICTOR Drilling Co., Wichita, Kans., purchased two sets of twin 6-71 GM diesels for a drilling application.

CITY OF ELLIS Kansas has just completed installation of their second Alco 12½x13 dual-fual engine. They just completed the overhaul of their first Alco unit installed in 1946 after approximately 38,000 hours of operation.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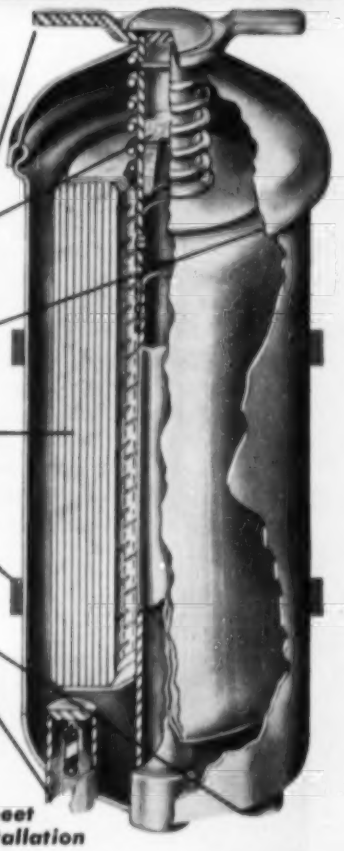
- ***Elements*** **are designed to give a maximum of filtration, accomplished by the use of perfected filtering media in relation to service requirements.**
- ***Sturdy clamp-type mounting*** **for safe installation under all conditions.**
- ***Drain*** **is located at the bottom of oil sump.**
- ***Inlet at bottom*** **for ease and safety of installation. Inlet check valve prevents drainback and undesirable turbulence.**



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EL MONTE CALIFORNIA

# NEW RECTANGULAR AIR CLEANER

*By* BRUCE W. WADMAN

UNITED Specialties Company, in conjunction with the introduction of the new International Harvester TD-24, TD-18A, and TD-14A diesel tractors, has announced a new type of rectangular oil bath air cleaner for diesels which is being used on these tractors. This rectangular air cleaner has been designed for heavy-duty work on diesel tractors, trucks, and industrial power units.

Heretofore, diesel air cleaners have mostly been round, and United has brought out a rectangular air cleaner to meet the problems of space limitations on modern diesel equipment and keep pace with the increased air demands of new high output engines. Tractor and air cleaner manufacturers have been faced with the knotty problem of severe space limitations on tractors and higher output tractor engines requiring larger air cleaners. This situation will only be intensified in the future as more powerful engines are developed, accompanied by increased air demands, which will necessitate even larger air cleaners because the size of the air cleaner is directly proportional to the air demand of the engine.

The rectangular air cleaner design, according to United, offers the following advantages to offset these problems: (1) Its shape follows the rectangular shape of tractors, trucks, and engines themselves. This allows the air cleaner to be installed snugly alongside the engine under the hood, with a minimum of side overhang.

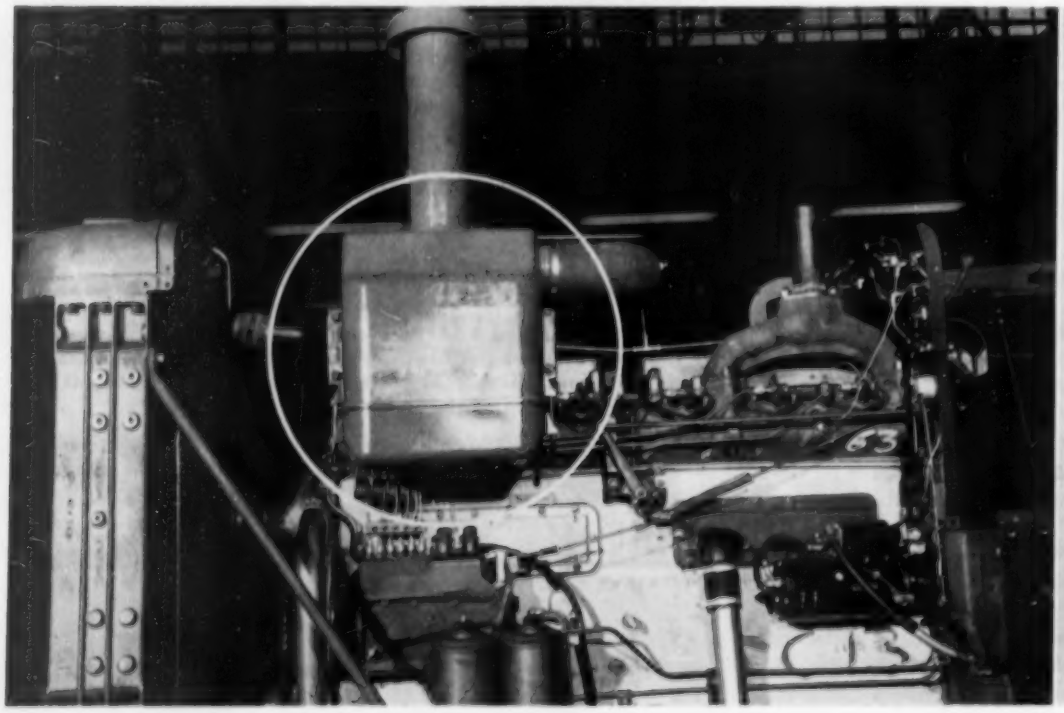
Economy of installation is achieved by mounting the air cleaner close to the engine and its intake manifold. The outlet from the air cleaner can be taken at any point around the perimeter of the clean air chamber so that the connection to the manifold will be as short as possible. (2) One of the important things in an oil bath air cleaner is to slow down the air velocity through the cleaner. If the area is too small, the velocity, of necessity, must be high and will tend to carry oil over to the engine, and for this reason there are many sizes of air cleaners to handle the air demand of engines of different sizes. The rectangular shaped air cleaner accomplishes, to a large extent, increased cross sectional area without increasing the external dimensions. For example, a square with a side the same length as the diameter of a circle contains 27% more surface area. This square can be converted into a rectangular shape which is not as wide as the circle and contains more cleaning surface area. The following will illustrate some of the air cleaner sizes United is now building and the capacities of these units.

85 series—5¾ in. x 9½ in. for air capacity of 175 cfm.
86 series—6½ in. x 11 in. for air capacity of 240 cfm.
87 series—7½ in. x 12¼ in. for air capacity of 300 cfm.
88 series—8¾ in. x 14 in. for air capacity of 400 cfm.
90 series—10 in. x 16 in. for air capacity of 525 cfm.
92 series—11½ in. x 19½ in. for air capacity of 740 cfm.

The 90 series air cleaner is being used on the new International Harvester TD-24 tractor, the 87 series cleaner on the new TD-18A tractor, and the 86 series cleaner on the new TD-14A tractor. It can be seen from the sizes illustrated above that the rectangular design contains flexible design features that permit a wide range of capacities without the drawback of unmanageable sizes. Aside from its rectangular shape, this new air cleaner has a number of outstanding internal design features that merit discussion. (1) Intake air is subject to oil wash continuously from zero to maximum air flow because the inlet stack is immersed about ¾ in. in the oil bath, and any air flowing through the air cleaner must first displace this oil before it can go through the filter elements.

(2) The oil cup has two important features. It has a splash baffle arrangement that separates the oil cup into an active washing zone and an inactive zone where dirt settles from the oil continuously while the cleaner is in operation. The circulation of oil through the washing zone promotes settling other dirt from the oil as it is removed from the air. This keeps the oil fluid and free to flow even though a lot of dirt has been caught. The splash baffle divides the volume of oil in the oil cup into two parts for another reason. A definite amount of oil is established to provide the washing action. This is very important since the capacity or pullover of the air cleaner is controlled by this means. If more oil is added, then the pullover or air capacity of the cleaner is reduced. This can happen in several ways, but where most cleaner difficulties arise is in rough terrain where slopping conditions cause an additional amount of oil to be thrown into the air stream. This causes the pullover to occur at a much lower air flow. United engineers state that this cleaner features an oil

**Photo of International Harvester TD-24 tractor diesel engine on the assembly line. This gives a good view of the United rectangular air cleaner installed on the engine and shows the connections to the intake manifold.**



**International Harvester TD-18A diesel crawler tractor showing United rectangular air cleaner under the hood.**

control that is as definite during rough operation as under stationary conditions.

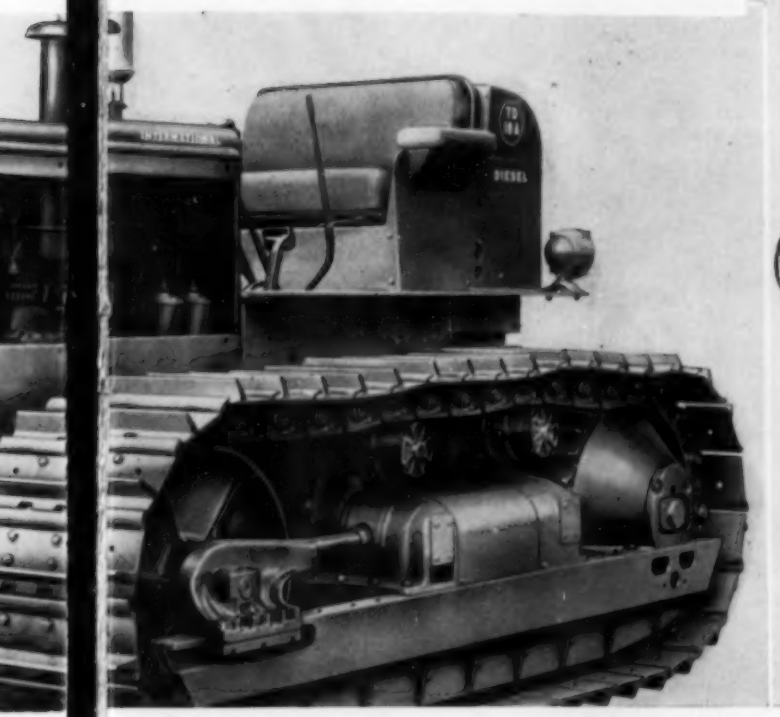
(3) Another feature of this cleaner is the large spray surface of the oil into the air stream and on to the bottom surface of the removable scrubber filter element. This is accomplished with fingers extending inward along the entire perimeter of the active washing zone cup. These fingers provide more surface for oil spray, and create eddies to pull the oil up for best mixture with the air. It is not necessary, therefore, to break the oil up into a fine mist which may cause a wet outlet. The additional circulation of solid oil gives high cleaning efficiency and the ability to absorb dirt at a high rate of dust feed, according to United engineers.

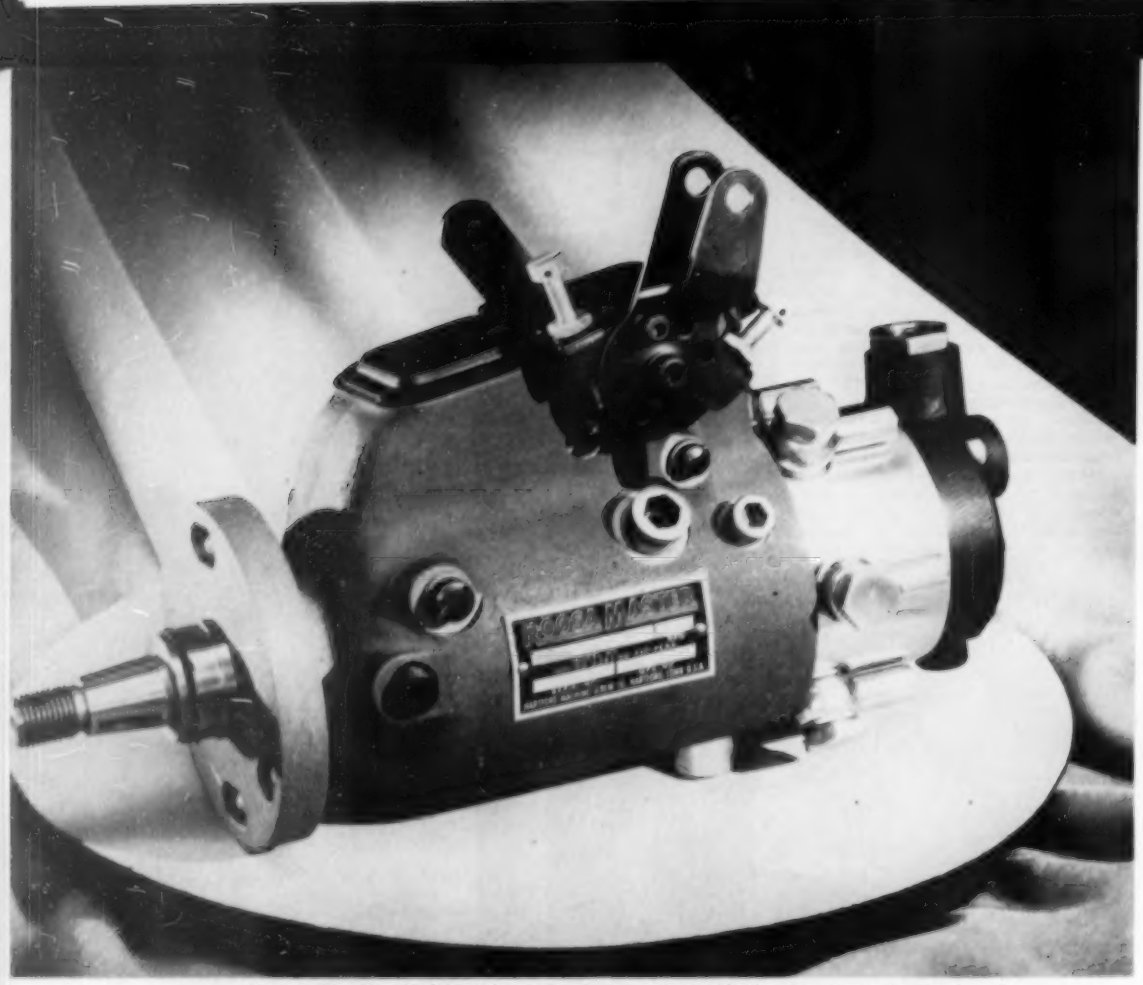
(4) This air cleaner has two filter elements: a removable scrubber element and a fixed pack element. Both elements are made from small wire springs which resist nesting.

(5) Maintenance procedures are very simple on this cleaner. There are just two bolts on the side that must be loosened to drop the oil pan. Then the scrubber element can be easily taken out, being right above the oil pan and held in place by only one screw in its center. This makes it very easy to remove the scrubber element for cleaning. In certain operations, where there is roughage in the air, this lower scrubber catches the roughage which has to be removed periodically. The air cleaner is also designed so that the scrubber element cannot be installed improperly. It just won't fit if put in the wrong way.

This new rectangular air cleaner was designed to meet the tough, heavy duty service requirements of rugged diesel equipment like the International Harvester TD-24, TD-18A, and TD-14A diesel tractors, and is a good example showing how accessory manufacturers, with new ideas and designs, keep pace with engine developments to provide better performing diesels to users.

**Cutaway view of rectangular oil bath air cleaner. Dirty air, represented by black arrows, comes down the inlet stack into the oil washing area. The oil is represented by red color and the oil flow and washing action is shown. Clean air is represented by white arrows and can be seen going through filter elements into the clean air chamber. In the oil cup, the inactive zone can be seen filled with oil with dirt settling out into the bottom. The baffle arrangement can be seen that separates the air washing action from the inactive section where the oil returns from the filter element. In returning into the active washing section, the oil flows by gravity through a small opening at the bottom of the baffle and across the top of the oil washing cup to the fingers where it begins washing action again.**





Here is The Hartford Machine Screw Company's contribution to progress in diesel engine fuel injection systems. Users will welcome its smaller, lighter, simpler design and its lower cost.

a reality, the Roosa-Master Pump was no exception. Its manufacturers were plagued with a multitude of mounting arrangements and drives. And almost every application had its own peculiar housing.

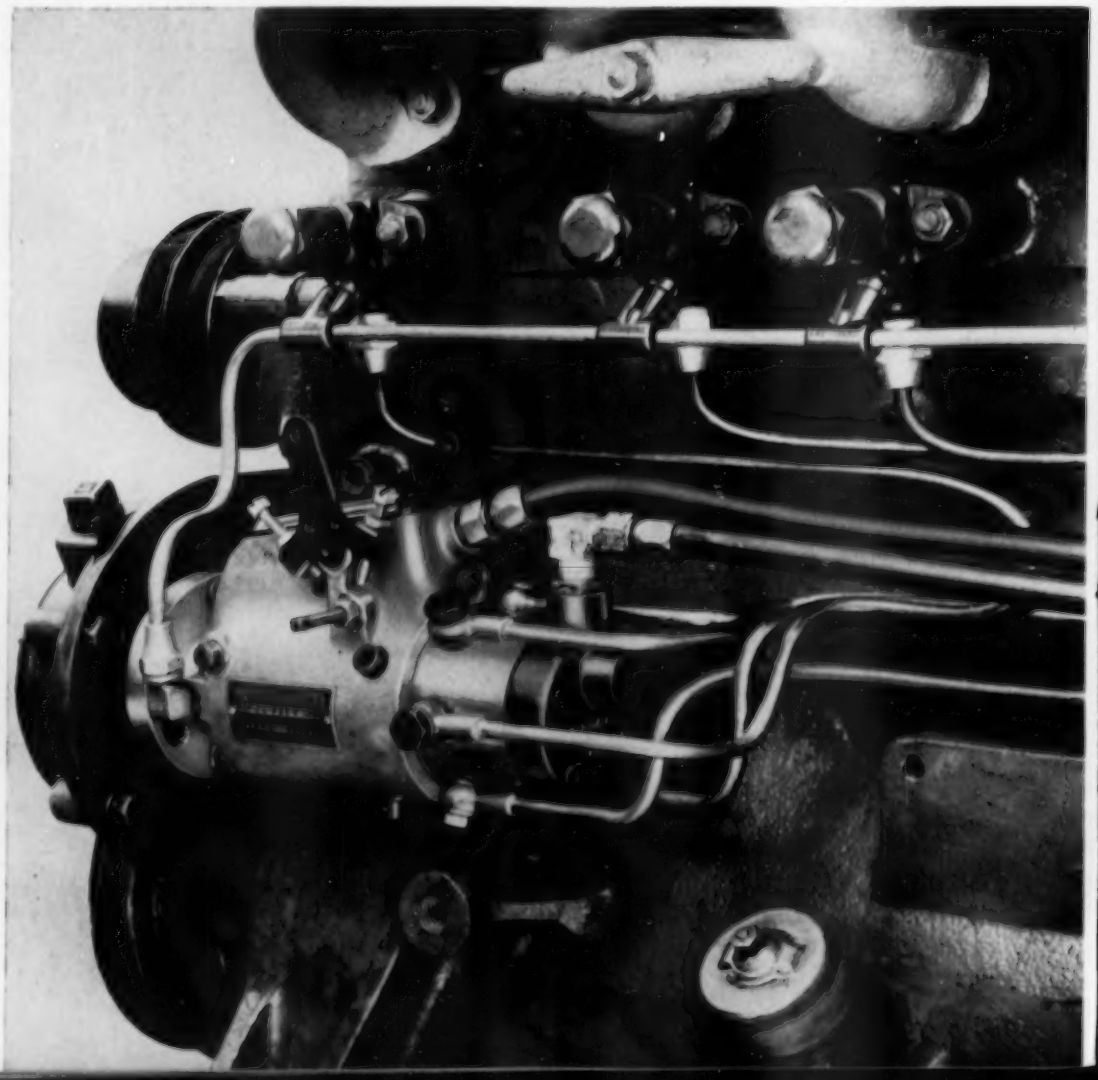
The "B" model is now in production and there is but one housing casting. The flange contains four elongated slots for mounting. For conventional horizontal or distributor mounting, the two slots 180° apart are recommended. However, in the case where it is desired to mount the pump in the center of a "V", the two slots are inaccessible. Then the three slots 120° apart are used. The throttle lever and mechanical shut-off lever are so positioned as to be convenient for mountings on either the right or left-hand side of the engine.

When a torque control device or a mechanical means of shutting off the fuel supply was specified in the "A" model pump, it became an accessory and as such increased the pump cost. In the "B" model pump, the design is such that both of these features are inherent in the pump.

The outstanding feature of the drive is based on the fact that the pump can be (and in several present applications is) supplied without a drive shaft. In these cases the pump drive shaft is an engine part and this fact is particularly advanta-

# NEW ROOSA MASTER

This view shows the new Roosa-Master Model B fuel pump mounted on an engine. One housing casing takes care of the unit. Various accessories can be easily attached to the housing.



FOR the second time in as many years, The Hartford Machine Screw Co. has taken a major step in the field of fuel injection. In January of 1953, after more than five years of testing, research, development and more testing, the Roosa-Master Fuel Injection Pump was formally announced. It can best be described as a single cylinder, opposed plunger, inlet metering, distributor-type pump. This article, however, concerns itself with the redesign of that unit with the result that it is now even smaller, lighter, more compact, and further simplified. And what is more important, the resultant cost has been lowered.

It is significant that no changes have been made in the basic principles of the pump. In fact, the major components, i.e., the internal cam ring, the hydraulic head and distributor rotor assembly, and the built-in fuel supply pump—are the same and interchangeable with the original "A" model pump.

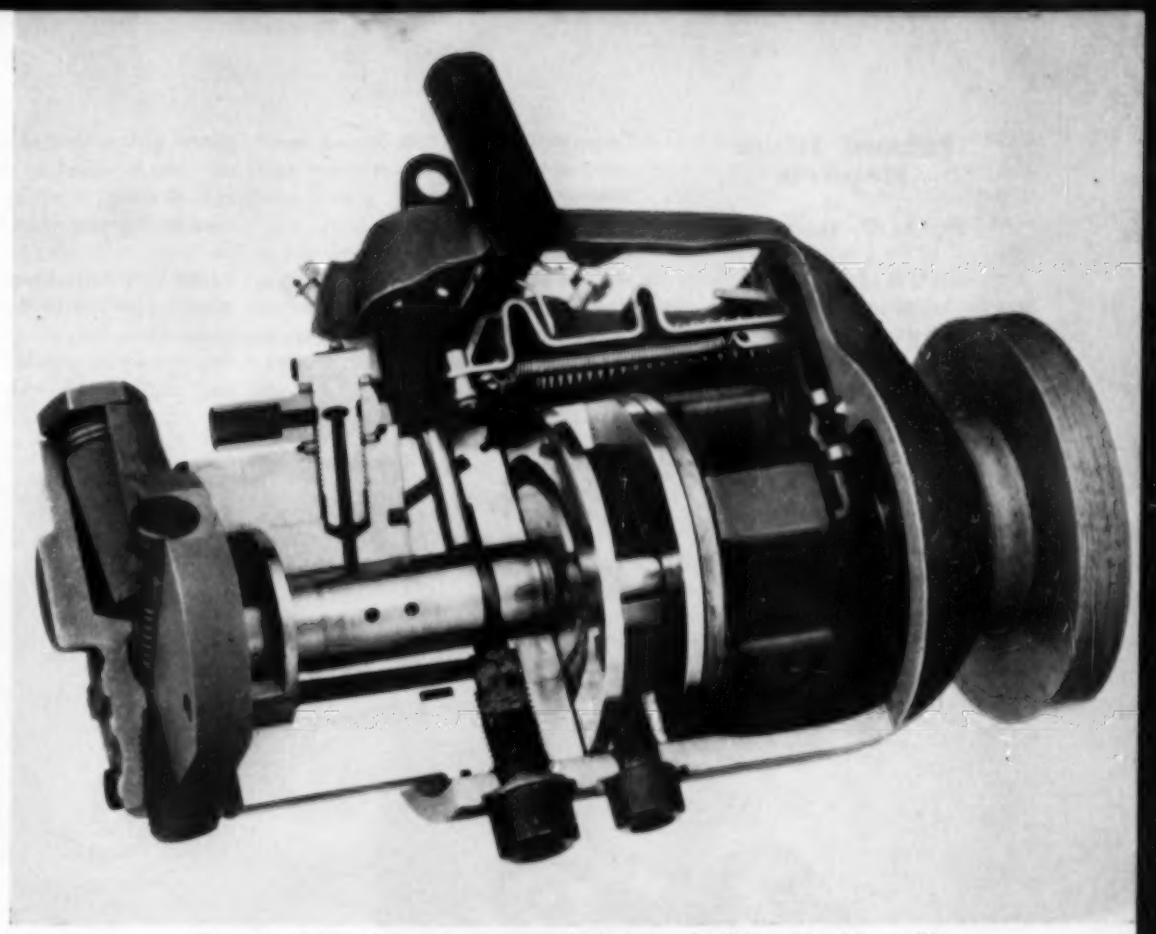
Basically, the changes evolve around the pump housing, the rearrangement and simplification of the pump internal parts (primarily the governor parts) and an unique drive arrangement.

Almost every engine manufacturer has his own preconceived ideas as to how a fuel pump should be mounted and driven. And as every fuel injection manufacturer knows through rather bitter experience, this adds greatly to the manufacturing problems and costs. Until the "B" model became

geous to those interested in service. The O.D. of the flange has graduations for timing reference which permits the pump to be removed by merely removing the mounting screws and sliding the pump off the shaft. Reassembly is made foolproof by the tang and slot drive within the pump. To eliminate the possibility of reassembly and being 180° out of time, a small 1/16-in. pin is located in the tang of the drive shaft and upon assembling the pump, the pin engages in a hole in the rotor insuring assembly "only one way".

This drive feature has been made possible by a rearrangement of the pump internal parts. Originally the governor weight retainer, which contains the governor weights, was affixed to the drive shaft and rotated on it. Now the retainer is turned around and affixed to the distributor rotor with the drive shaft passing through its center and not being connected in any way. Changing the location of the governor weight retainer cage has permitted the use of a compression spring for the governor spring rather than the tension one used heretofore. This feature, of course, gives greater sensitivity over a wider speed range.

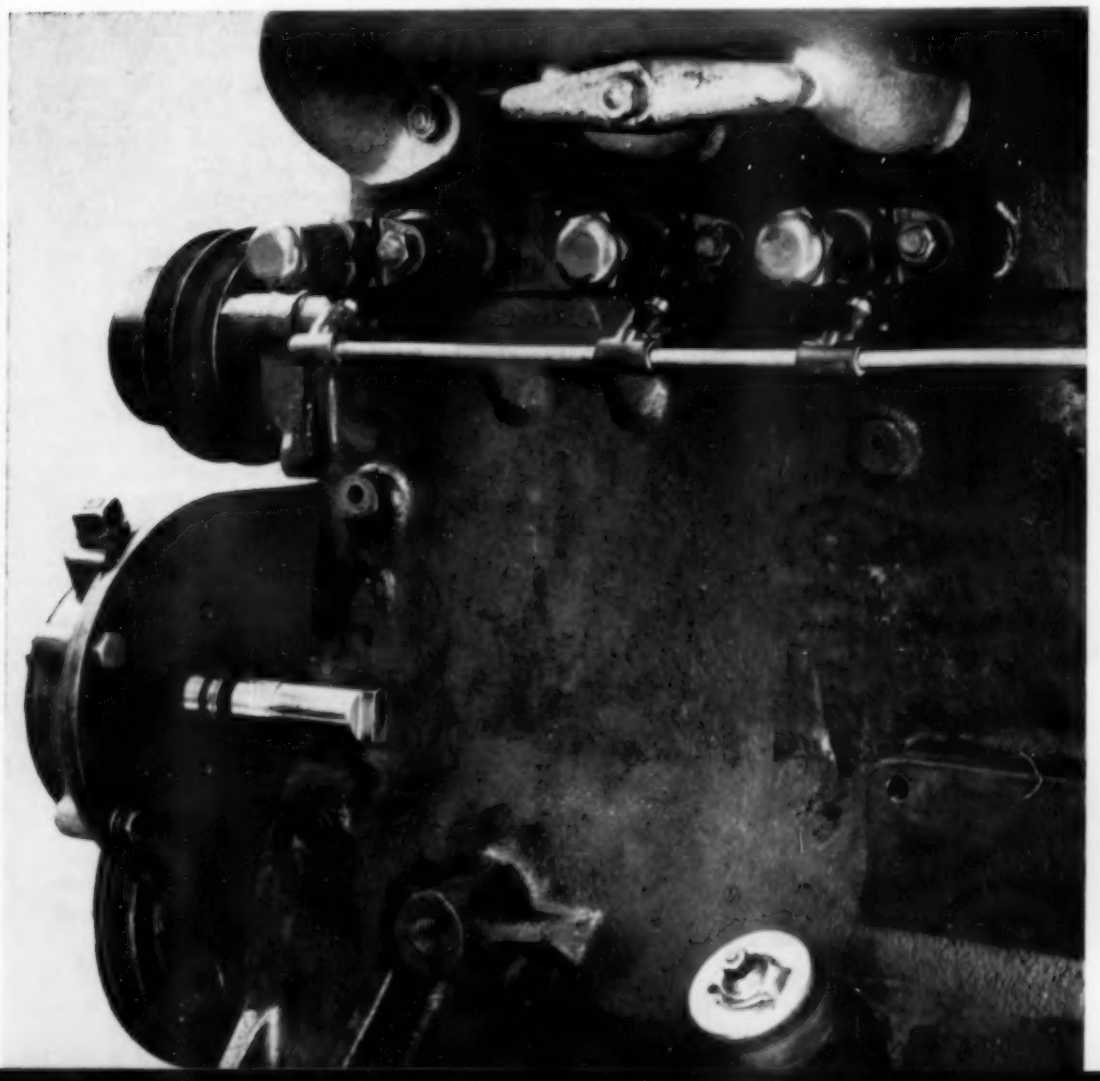
Almost all of the governor parts are now stampings and particular savings have been effected through a one-piece governor retainer stamping. The



**This sectional view of the new pump reveals the design simplicity achieved by modifications in the Model A Roosa-Master single cylinder, opposed plunger, inlet metering, distributor-type pump.**

# MODEL B FUEL PUMP

**The Model B Roosa-Master can be supplied without a drive shaft. In this photo, with pump removed, the drive shaft can be seen as a part of the engine. This assures ease in removal and accurate timing upon reassembly.**



weights are folded up flat stampings with various sizes of slugs spotwelded to achieve varying governor characteristics.

In summary, the changes are found in the housing, the drive, and the internal governor parts. There is now one housing for all. The various accessories, such as automatic advance, electrical shut-off, vacuum shut-off, smoke device and a new variable speed droop adjustment (available for generator applications), can be affixed to that one housing simply and easily. This leads to the final step in simplification which is currently being undertaken—a die-cast housing.

The drive shaft can be made independently of the pump. When it is made part of the pump, standardization has virtually been completed to have but one shaft for all mountings. And, finally, the pump internal parts have been sufficiently simplified to reduce cost—yet, overall performance characteristics have not been jeopardized—in fact, they have been bettered.

As production on the "B" model increases and, as old applications are changed over, it is hoped to obsolete the "A" design. The "B" model is widely welcomed as another step in Hartford's effort to simplify fuel injection and to produce a functionally sound system at low cost. A detailed description of the Roosa-Master Model "A" pump appeared on pages 230-231 Volume 19, DIESEL ENGINE CATALOG.

## Inland River Reports

*By* A. D. Burroughs

AT EVANSVILLE, we saw the *Southern* heading down the Ohio with 11 loaded barges and 8 empties. Owned by Union Barge Line Corp., this powerful boat was built at Neville Island by Dravo Corp. in 1952. She had a good speed powered by Superior diesels with a total 3000 hp at 600 rpm.

AT PITTSBURGH we were pleased to see one of our old favorites, the *Paul Blazer*, still in top form. Built in 1948 by Calumet Shipyard, she has put in seven years of dependable service. Powered by National Superior 8 cyl. 14½x20 diesels with a total of 2000 hp at 300 rpm, she is owned by the Ashland Oil and Refining Company. She was upward bound with eight barges of oil.

ALSO UPWARD bound was the neat *Northern* owned by Mississippi Valley Barge Line. She was originally named the *Bernard B. Walker* when she was built at Pascagoula, Mississippi by F. B. Walker & Sons, Inc. She has Fairbanks-Morse opposed piston 10 cyl. diesels with a total 3200 hp at 288 rpm. When we saw her at Tell City, Indiana she was doing a good speed with 18 loaded barges and 4 empties.

ANOTHER old favorite, *Sinclair St. Louis*, was sighted on the Ohio as she was upward bound with 7 loaded barges. She is powered by General Motors 16-278Z diesels with a total 2880 hp. Originally named the *Mattie P. Simpson*, her name was changed when the Simpson Oil Co. sold her to the Sinclair Refining Company around Christmastime in 1951.

FROM INDIANA we enjoyed the letter and river photos sent by Frank Martin. The best of the group included a good one of *Mount Vernon*. Named for the headquarter city of her owner, the Cooper-Bessemer Corporation, this diesel towboat is noted for her excellence in handling and dependability. She is powered by three Cooper-Bessemer FV-8 diesels with a total 2100 hp.

ANOTHER GROUP of photos from St. Louis pictured the well-known favorite, *Stephen Foster*. Built in 1948 by St. Louis Ship with Enterprise 8 cyl. 16x20 diesel for 1700 hp at 360 rpm, supercharged, she is now owned by Commercial Petroleum & Transport Co., Houston, Texas.

OUR COMPLIMENTS to the *Delta Cities*, a beauty in appearance and performance seen upward bound on the Ohio in February. Owned by Lake Tankers Corp., New York, *Delta Cities* has 9-foot diameter stainless steel controllable-pitch props made in Sweden. Quarters have individual room thermostats for controllable radiant heat. Plenty of comfort and plenty of dependable power from the Fairbanks-Morse diesels with a total of 3200 hp.

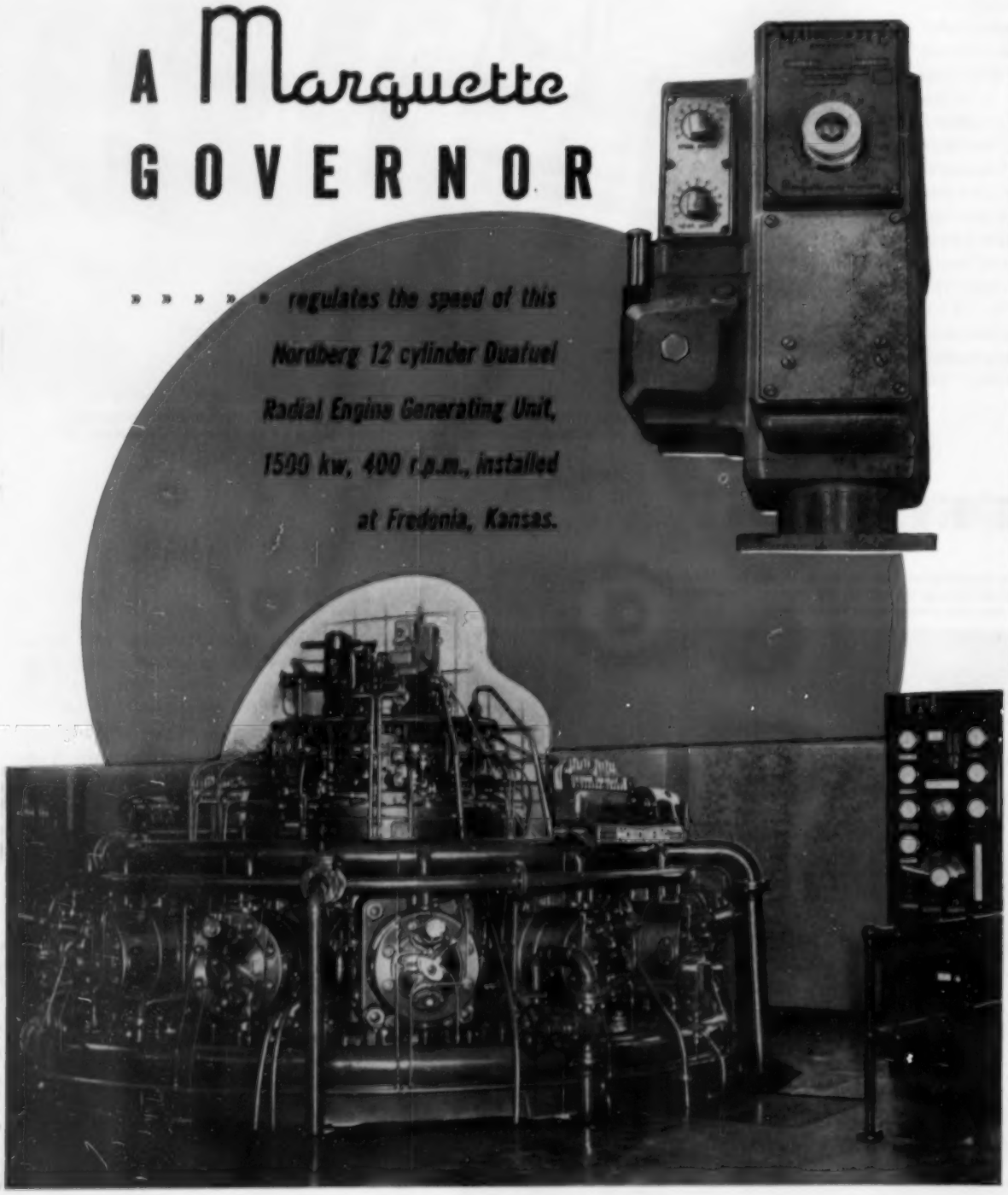
AT JEFFERSONVILLE Capts. Harold Birchfield and Leo Hughes were doing a smooth piloting job on the *Jefferson*. She was towing the *Southland*, moving it from Neville Island to Jeffersonville. She had added a barge of caustic to its tow at the new Solvay Process plant at Round Bottom. The *Jefferson* has Cooper-Bessemer LS-8 diesels with a total 2000 hp. She is owned by American Barge Line Co., Louisville, Ky.

FROM CLARINGTON, Ohio the *Lucy Jane Lucas* was downward bound with a total of 33 barges of coal. She is equipped with General Motors diesels with a total of 1000 hp and was handling her heavy load with considerable ease and speed.

*FRANK L. BLASKE*, named for Capt. Hugh C. Blaske's father, has been a busy


A Marquette GOVERNOR

» » » » » regulates the speed of this Nordberg 12 cylinder Dualfuel Radial Engine Generating Unit, 1500 kw, 400 r.p.m., installed at Fredonia, Kansas.



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ROTARY HIGH PRESSURE OIL FIELD PUMPING MACHINERY

boat these past weeks. Reports from all along the inland rivers list this Blaske Line's boat, which gets her 1200 hp from her Atlas Imperial diesel engines.

THE POWERFUL Cooper-Bessemer diesels JS-8, 13x16, supercharged with a power of 3330 were providing good performance for the *Lin Smith* upward bound on the Ohio with 18 barges the first of March.

## Detroit Diesel Appointments

E. F. Bentley, general sales manager of Detroit Diesel Engine Division of General Motors, has announced the appointment of R. L. Burpee, formerly sales promotion manager, to the newly created position of merchandising manager. Succeeding Mr. Burpee as sales promotion manager will be T. L. Guarniere, whose former position as service training director will be filled by Harold J. Vaughn.

## Meeting of Oil and Gas Power Division, ASME

The proposed program of the Oil & Gas Power Division, ASME, meeting in Washington, D.C., June 6 to 9 at the Statler Hotel will feature a number of interesting papers by leading personalities in the field. The opening session, chaired by Capt. Howard Stoner, USN, with Karl Stinson of Ohio State University as vice-chairman, will witness the presentation of two papers. Anker Antonsen of Fairbanks-Morse will discuss "Submarine Engine Development" and Eric Brater of Cleveland Diesel engine Division of GM will discuss "Development of a Large Two-Cycle Gas Engine."

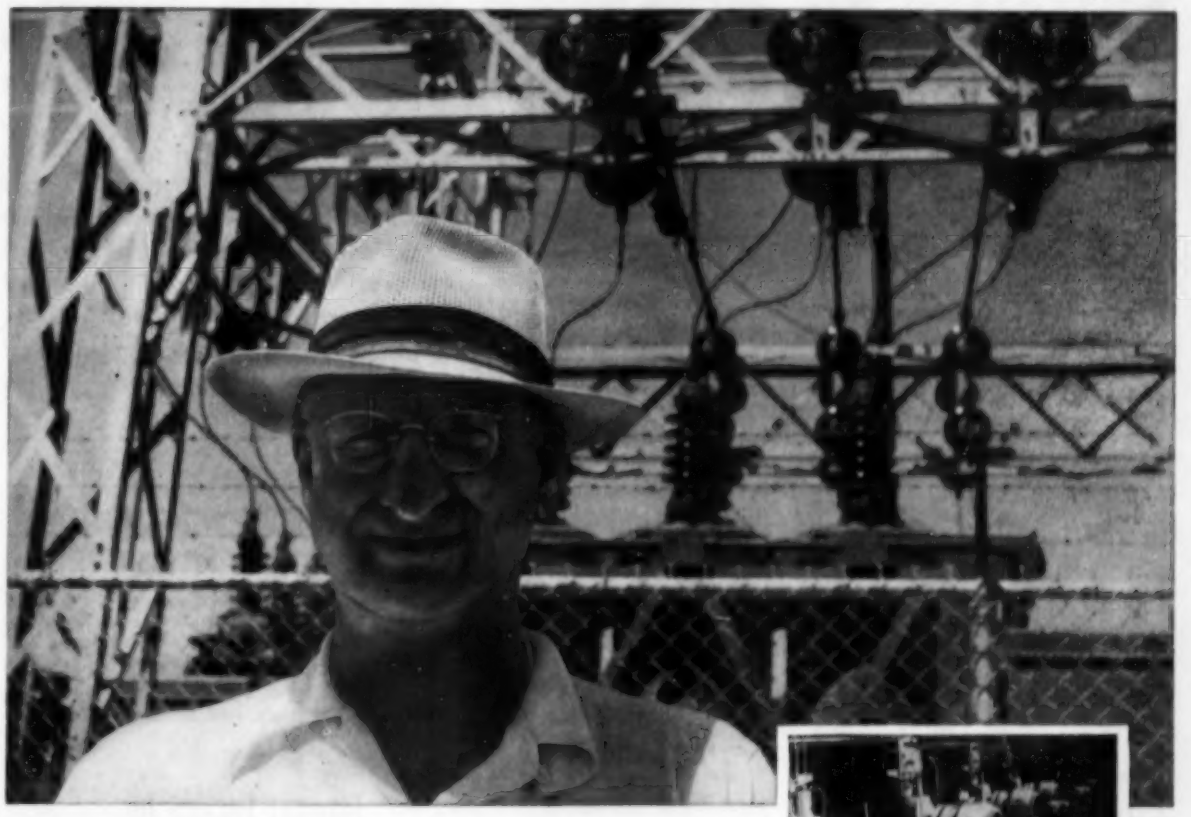
The afternoon session of Monday, June 6th will witness the presentation of two more papers, "Gas Turbines For Ship Propulsion" by John McMullen of the Maritime Commission and "The Philosophy Of Vee Engine Design" by Ralph Boyer of Cooper-Bessemer Corp. This session will be chaired by John Sawyer, Bureau of Ships, USN and Tom Sawyer of the American Locomotive Co. will act as vice-chairman.

Monday's evening session will be devoted to a general technical Committee meeting with the subject being "specifications." Vice-chairman will be James Barnaby of Worthington Corporation. A chairman had not been named at the time we went to press.

The Tuesday morning session will lead the day off with a paper entitled, "Heavy Fuels For Gas Turbines" by Harry King, USN and Harold Nutt, USN. A panel discussion will follow with Capt. Latrobe, USN acting as moderator. The chairman for this session will be John Gibb of the Socony Vacuum Oil Co. The vice chairmanship will be held by Brian Corrigan of the Texas Company.

The final paper to be presented Tuesday afternoon will be "Standardization of Diesel Engines" by Capt. Carl A. Peterson, USN and Lcdr. Wilford Howerton, USN. The panel discussion on the same subject will have as its moderator, Capt. William Dolan, USN. The chairman for this session will be Adm. W. D. Leggett, USN, head of the Navy's Bureau of Ships, with T. M. Robie of Fairbanks, Morse acting as vice-chairman.

Charles Cooper Vice-President of Cooper-Bessemer Corp. will be toastmaster at the luncheon and Vice Admiral R. F. Good, Deputy Chief of Naval Operations (Logistics) will deliver a brief talk on oil and gas power in their relation to logistics. Tom E. Hughes, General Manager, Cleveland Diesel Engine Division of GM, will act as toastmaster at the banquet and David W. R. Morgan, President of The American Society of Mechanical Engineers will address the dinner guests. The principal speaker for the evening has not yet been named.

# POWERFUL GUY!

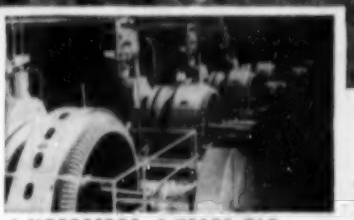
**His four Nordberg Diesels, lubricated by Cities Service DC-940 Oil, supply six Oklahoma Counties with REA power. Have one of lowest cost-per-KWH records of entire REA.**

His name's H. P. Wingo, and he's Chief Engineer of the REA plant operated by Western Farmers Electric Cooperative.

For the past four years, since his plant began operation in Woodward, Oklahoma, he's been responsible for a consistently high power efficiency rating, measured in cost per kilowatt hour...as high as fifth among all 42 REA plants! To maintain this record, he's had important help... help from four 1100 KW Nordberg dual-fuel engines...and help from Cities Service DC-940 Oil.

"Our engine compressions are the same today as they were after the first three months' operation," says Wingo. "In addition, using Cities Service DC-940, rings have remained absolutely free, liners have worn less than .0015, and we average 14,000 horsepower hours per gallon of oil. Filter elements last up to 1,500 hours."

Wingo has added his words of praise to those of scores of other users of Cities Service Lubricants. Summed up, these reports clearly demonstrate that superior performance is not the exception, but the rule, with Cities Service products. Your Cities Service Lubrication Engineer can readily explain why. Talk it over with him. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



4 NORDBERGS, 4 YEARS OLD ...yet engine compression remains the same as after first three months of operation at Western Electric REA Plant, Woodward, Okla. Rings "absolutely free," liners worn less than .0015, oil consumption at 14,000 H.P. hrs. per gallon using Cities Service DC-940 Oil.

CLOSE CHECK is kept on entire operation. Meanwhile, Cities Service Lubrication checks wear in Nordberg engines, helps engineer Wingo maintain record of low cost electricity. Supplying economical power to six Oklahoma Counties, plant's power efficiency rating has been as high as 5th in entire REA.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

## West Coast News

*By* James Joseph

SHEPHERD Machinery Co. . . . that's the former Shepherd Tractor & Equipment Co.'s new name, adopted Feb. 1. W. W. Shepherd, general manager, announced that Shepherd's ownership remained unchanged. Under its new name, Shepherd Machinery Co. will serve Los Angeles, Orange and Inyo counties as distributor for Caterpillar, John Deere and allied machinery. Simultaneously, they unveiled plans for new sales, service and display facilities on a 34-acre site along Los Angeles' San Gabriel River Freeway at Cliota street. Construction is to start soon on the 110,000 sq. ft. structures.

FOR THE Southern Pacific Co., San Francisco, a Fairbanks Morse model 49B4½, 6 cyl, 180 hp diesel unit.

FOR Torona, Calif.'s Davenport and Ruth gold mines, two Caterpillar D-13000, 75 kw diesel electric sets with oversize 100 kw, Louis Allis generators. Another D13000 Cat diesel was also purchased, for direct connection to a 365 cfm Gardner-Denver compressor . . . all three engines for the mine projects operated by Argus Development Co.

FOR Norm Hagen's sportfishing boat, *Sportking*, Newport Beach, Calif., two D337 Caterpillar marine engines with 3:1 Snow-Nabstedt reverse and reduction gears. The vessel is 65 ft. long, weighs 63 tons. The two 170 hp D337s replaced three 275 hp engines.

RECENTLY delivered to the Los Angeles Harbor Dept. a GM 2-71 marine diesel, by Crofton Diesel Engine Co., Inc., San Pedro.

TWO Fairbanks Morse Model 45, 6 kw diesel electric sets, radiator cooled, have been purchased by Seattle's Berger Engineering Co.

*ANNE*, a 58-ft halibut boat owned by Erling Malnes, Seattle, has been repowered with a Model NHM-600 Cummins diesel, with a 3.1 Twin Disc reverse and reduction gear. Engine sold and installed thru Seattle's North Coast Marine Engine and Equipment Co. The Cummins replaced another which had given service since 1946, when the *Anne* was built.

FOR M. R. Cliff Tugboat Co., Ltd., Vancouver, B. C., a new diesel tug—the *Mary M II*, powered by a Cummins NHRMS-600. Tug will be stationed in the Campbell river area.

CURRENTLY being installed in two Kenworth Model 524 loggers, at B.C. Forest Products, Ltd., two new Cummins NT-6-B turbo-diesels, replacing two Cummins HRB-600s. New engines with their exhaust-gas driven superchargers are rated 235 bhp at 2100 rpm.

GREATER SPEED and higher pay load are predicted for the Norco installed 66-ft halibut boat *Leviathan*, working out of Seattle, with installation of a Cummins NHRMS-600 high speed diesel.

TO POWER a saw mill located near Grants Pass, Oregon, O'Brien & Company, Grants Pass, has purchased a Buda Model 6DA-844.

ERNEST Robertson of Rockaway, Ore. is repowering his logging truck, model A-51, with a Buda 6DAS-516.

PORTLAND'S Wagner Tractor, has has taken delivery of a Buda 6DT-468 to power their TR-9 tractor; a Wagner TR-6 tractor is being powered by a 6DT-317 Buda.

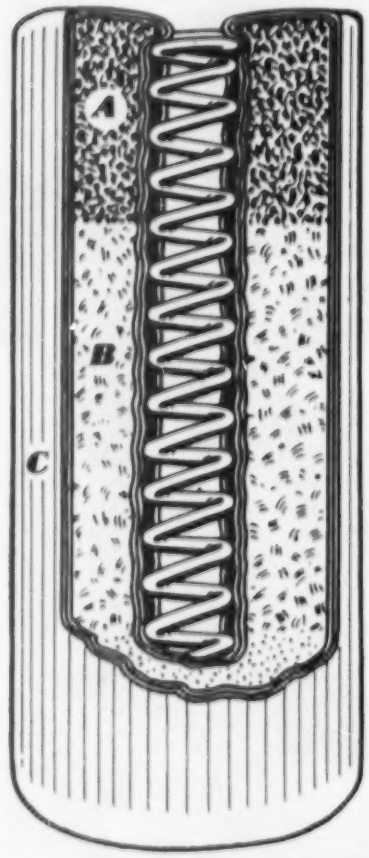
FREIGHT-HAULERS are watching with something more than passing interest the inauguration of piggy-back truck service by Southern Pacific, over-


# COMPLETE OIL FILTRATION IS NEVER SIMPLE

by CHARLES A. WINSLOW

**Conditions under which most industrial engines operate may introduce grit, sludge, acid or moisture into lubricating oil. To remove these engine-destroying materials requires FULL FLOW filtration under cold and hot operations, without incurring back pressures, and with complete protection to critical surfaces in case of any part failure. Contaminants must be removed without affecting additives.**

**This complete protection for lubricants is not simple. It can best be accomplished with the four materials combined in Winslow CP* Elements. These elements are also designed for definite and predictable flow and pressure characteristics. When they are correctly applied, the oil is *all* filtered under *all operating conditions*, through these successive steps:**




(A) CP* Material accepts varying percentages of oil flow, to maintain acceptable pressure.

(B) Combined thread and cellulose absorbs moisture and gums.

(C) The patented outside wrapper is an effective filtering medium.

### CP* Material Gives Automatic Pressure Control

***The specially treated CP* material accepts varying percentages of the total oil flow, as conditions dictate; thus maintains acceptable pressure losses without opening by-pass valves, and insures 100% Full Flow filtration at all times. All harmful particles are removed from the oil.***

### Cotton Thread Combined With Cellulose Fibre

**The cotton thread is porous and fluffy for full dirt retention, and creates a multitude of intricate passages to catch minute particles. It is combined with clean, dry cellulose fibre, which prevents packing and channeling of the filtering media. This selected fibre also absorbs gums, moisture and varnish that may be present in the oil.**

**The fourth filtering media is the patented double wrap of tubular cotton on both the inside and outside of the Winslow element.**

### Proportion of Materials Determines Pressure

**In a Winslow CP* Element the ratio of filter materials determines the rate of oil flow through the element. This ratio is set for each size and type CP* element, based on laboratory and field tests.**

### Element Packed for Progressive Filtration

**Each Winslow CP* Element has the same amount of material at the outer area as there is near the center. Obviously the material is more condensed at the center. This forms V-shaped traps for progressively smaller particles, increasing the capacity and useful life of the element. The tubular cover is also squeezed tighter at the center and is more open at the outside.**

**This combination of exclusive Winslow features and materials has been proved for years, under severe engine service, to be the most efficient and in the long run, the most economical method of lube oil filtration. We will be glad to give you complete data on filters and elements for your equipment. Please write or call the nearest office.**

WINSLOW FILTERS *CP is fully protected by patents and trademarks

Winslow Engineering Company 4069 Hollis Street • Oakland 8, California

night between LA and San Francisco. Curently it's a race between diesels—dieselized trucks making the same run by highway, diesel locomotives hauling the piggy-back flatcars and their trailer-loads. Piggy-back has been six months in operation along the east coast, both by trail and water.

### I-H Catalog on 'Dozer Blades

International hydraulic bullgrader and bulldozer blades matched to International T-6, TD-6, T-9, TD-14A and TD-18A crawlers are described in a 24-page catalog just published by International Harvester Company. The bulldozer blade assembly is solid welded without pin connections, providing a rigid, level blade. The bullgrader blade, connected by pins to the main frame, may be horizontally angled or vertically tilted. Balanced design is achieved by mounting blade equipment in front of, and hydraulic cylinders and other heavy parts behind, the tractor balance point. This distributes weight properly, retains the original tractor balance point and avoids traction loss.

The main frame of the bullgrader or bulldozer is attached to the International crawler at the track oscillation point. Thrusts are carried directly to pivots on the rear support brackets. Blade loads, which are transmitted directly to the tracks, have no effect on free track oscillation. Complete control of the blade is achieved with a single, four-position, easy-to-reach lever. The blade can be raised, held, lowered, and put in float position. Pressure on the cutting edge is developed by the weight of the blade and push arms only.

On the bullgrader, angling the blade for side-casting dirt, either to left or right, is a simple operation. The operator merely pulls the landside pins, uses one of them as a lever to shift the blade to the desired angle, replaces the pins and is ready to roll. Tilting the blade is just as simple. Other features are unobstructed vision for the operator, conveniently located controls, curved blades to keep the dirt alive and moving, manganese steel moldboards and easy-to-get-at lubrication points.

Full specifications of the International hydraulic bullgrader and bulldozer blades, and pictures of them on the job, are contained in the new catalog. It may be obtained by writing to Consumer Relations Department, International Harvester Company, 180 N. Michigan Ave., Chicago 1, Ill.

### Spark Arresters Detailed

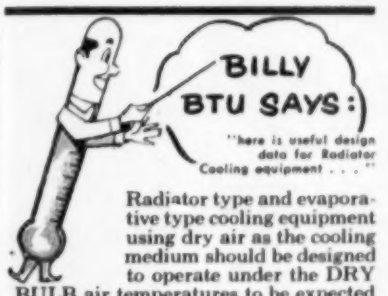
Its complete line of exhaust spark arresters, engineered for use with internal combustion engines, is illustrated and described in a new catalog sheet, now available from the Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio. The arresters provide protection against exhaust sparks, coming from the engines, caused by particles of carbon heated to incandescence. These sparks strike and adhere to the inside surface of the wire screen media. Since the screen dissipates the heat so rapidly that ignition temperatures cannot be maintained on the outside, the sparks are thus effectively arrested and "dampened" by the unit.

The wire screen medium is of stainless steel, arranged in layers to provide depth with minimum resistance to gas flow. End plates are of cold rolled steel, nickel plated to withstand high temperatures. On some models, the base is reinforced with manganese bronze casting. The free literature gives general operating and design data; detailed specifications, plus a handy Spark Arrester Selection Table, are likewise included. Copies may be obtained from the Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio.


Young Heat Transfer News

YOUNG RADIATOR COMPANY, RACINE, WIS.

# Seven Times More Heat Transfer Surface Provided by New Young Monofin Core




Radiator type and evaporative type cooling equipment using dry air as the cooling medium should be designed to operate under the DRY BULB air temperatures to be expected during the summer in the locality where the equipment is to operate. Equipment using cooling effect due to water evaporation is designed to operate under the WET BULB air temperatures to be expected.

For proper design, it is not satisfactory to use either the maximum air temperature, nor the average air temperature. Use of the maximum air temperature for design would result in the selection of cooling equipment too large to be economical, since it would be fully loaded only under the most extreme temperature conditions. Use of average temperature for design purposes would result in selection of equipment too small to handle the cooling load during a great portion of the operating time. It is necessary, therefore, to use some figure between maximum and average air temperatures.

The Young Radiator Company has prepared and offers to engineers engaged in the design and application of radiator type and evaporative type cooling equipment, data taken from the results of five years of summer records in the United States. This data may be used and considered as applying to an average year.

For a copy of this data, write for Bulletin 654, Young Radiator Company, Racine, Wisconsin.

**WRITE FOR FREE DESIGN TEMPERATURE BULLETIN OF THE UNITED STATES**

Helpful four-page Bulletin briefly discusses atmospheric cooling equipment design temperatures for the United States. Wet and dry bulb maps are fully illustrated with isothermal lines. Write Young Radiator Company, Dept. 405-D, Racine, Wisconsin.

**Monofin offers more contact surface than circular type fins.**

*Monofin* core, the most modern development in extended surface heat transfer, has seven fins per inch to provide 58 per cent more extended surface and 7 times more heat transfer than circular fin cores with edge contact.

Comparing cores using tubes of same size and thickness with 1-7/16" diameter, circular fins versus 1-7/16" *Monofin* . . . and with both fins .013 inch thick, note these differences —

Regular circular fins have 2.8 square inches extended surface per fin, while *Monofin* has 4.418 square inches per fin!

*Monofin* finned tubing is available with aluminum or copper fins, with various fin spacings for special applications.

Tube materials are copper, brass, steel or aluminum. Outside tube dimensions are ½", ⅝", ¾" and 1".

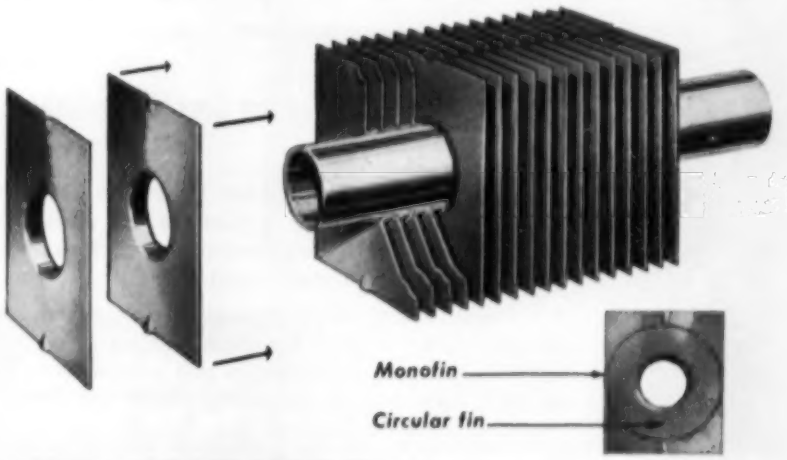
*Monofin* design advantages include more bursting strength with fin collar contact which completely encases the tube, protecting it from injurious impingement and atmospheric corrosion.

Straight in-line fins permit ease of air flow which causes less turbulence and resistance for greater fin cleanliness.

*Monofin* mechanical bond to the tube resists hot and cold cycles and will not loosen tube-fin assembly. Another important consideration is that tubes sheathed with *Monofins* are removable when damaged.

For further details, write for *Monofin* illustrated Bulletin.

*Monofin is a Young Radiator Company trademark.*




Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY
Heat Transfer Products for Automotive, Aviation and Industrial Applications.
Heating, Cooling, Air Conditioning Products for Home and Industry.
Executive Offices: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

## Gulf Coast Diesel News

*By* Michael T. Pate

J. S. GISSEL Company, barge operator of Houston, has bought two Stewart & Stevenson model 6MB75 dc generating sets, each delivering 75 kw. Powered by series 71 General Motors diesels, the units will be installed on a coastwise tanker.

DELTA Machine Company, Brownsville, Texas, has bought through the diesel division of Fairbanks, Morse & Company three 5-cylinder model 38F5¼, 575 hp units.

PRESTON Guidry, New Iberia, Louisiana, has bought from Waukesha Sales & Service, Inc., of Houston, a 125-hp Waukesha diesel truck engine for repowering a truck.

WILLIAM Surgi, New Orleans, Louisiana, has bought through Hercules Motors, Houston, a model DIX-2D 2-cylinder, 15 hp Hercules diesel which he will use on a generator drive.

MARINE Equipment Company, Houston, has bought through Whites, Inc. of Houston two model UD1091 International Harvester diesels, delivering 200 hp. The diesels will be used for generator drives.

R. L. TURNER Drilling Company, Sabine, Texas, has bought through Stewart & Stevenson Services, Inc., Houston, a 300 kw dc generating set, composed of two GM series 110, 6-cylinder diesels compounded into two dc generators. The unit is part of an electric oilwell drilling rig.

CITY of Farmersville, Texas, has bought through the diesel division of Fairbanks, Morse & Company an 8-cylinder model 38D8 ⅛, 1280 hp dual fuel engine to be installed in the Farmersville city power plant.

UNIVERSITY of Texas, Austin, Texas, has bought two Stewart & Stevenson model PD5 ac generating sets, each powered by a 2-cylinder Model AV2 Petter diesel.

SOUTHWESTERN Potash Corporation, Carlsbad, New Mexico, has bought two Waukesha model 180 DLC 40-hp diesels, each to power a jeep the company is using in its underground potash mining operation.

BRIDEWELL Drilling Company, Wichita Falls, Texas, has bought a twin-six series 71, General Motors diesel from Stewart & Stevenson Services, Inc., Houston. The diesel will be used to drive a 7¼x14 mud pump on a drilling rig.

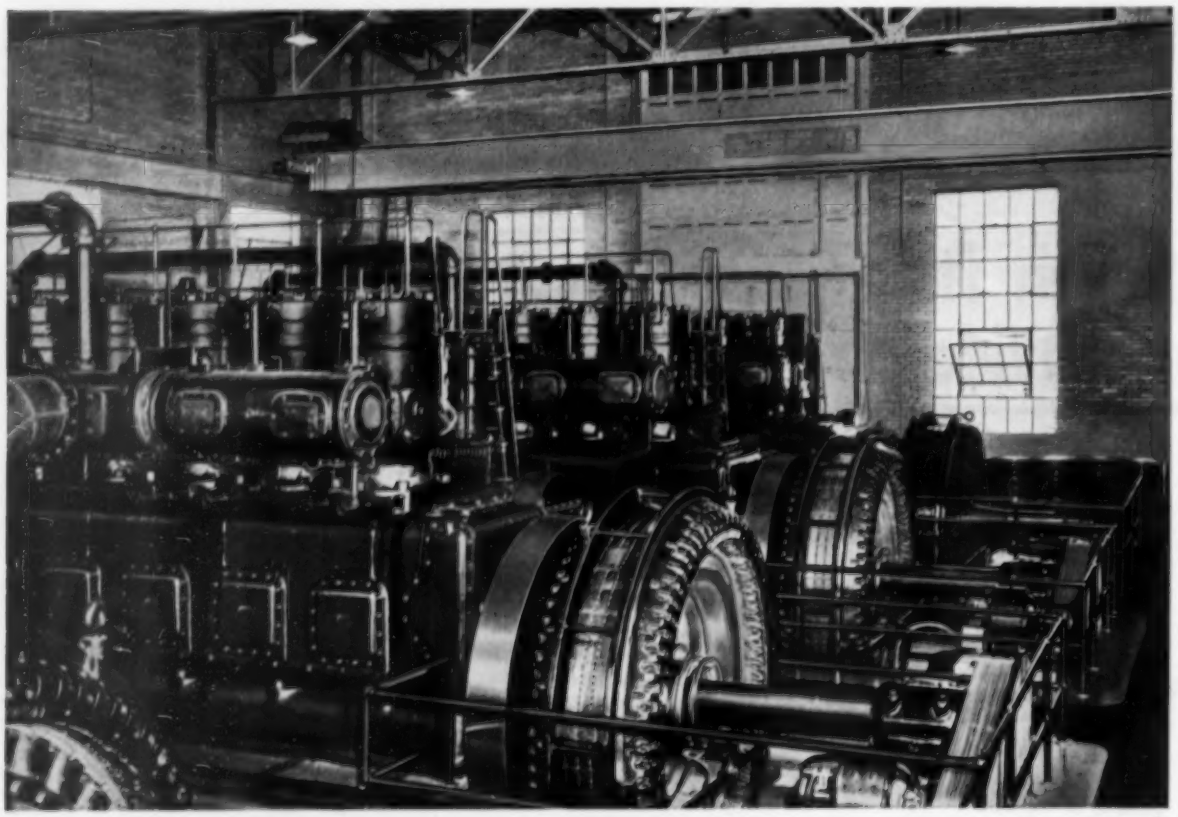
RAMON ROOTH, Bay City, Texas, has secured a model D13000 Caterpillar diesel from Mustang Tractor & Equipment Company, Houston, which he will use to drive a deep-well irrigation pump.

A. J. BABIN, Houma, Louisiana, has secured a model PD5 Stewart & Stevenson dc generating set which is powered by a 2-cylinder model AV2 Petter diesel. The unit will serve as auxiliary lighting source.

S. SANCHES, Webb, Texas, has bought a model UD14D International Harvester 57 hp diesel through Whites, Inc., Houston, to be used to drive a deep-well irrigation pump.

SAM CARLINE, Berwick, Louisiana, is having a model DIX6ES supercharged, 150 hp Hercules diesel installed in his Sewart-built twin screw boat. The diesel will drive through a 2:1 reversing gear.

SAFETY CRAFT, Inc., Morgan City, has bought through Hercules Motors, Houston, two 150 hp model DIX6ES supercharged Hercules diesels which

"We're Proud of This Plant!"

says Don H. Decker, — Plant Supt., Thumb Electric Cooperative, Ubly, Mich.

Manager Orville Hurford and Mr. Decker are justifiably proud of their 4-diesel engine generating station. The plant has been an outstanding financial success since the day it was first opened. Several times it has occupied #1 position on the REA Running Plant capacity chart.

Mr. Decker writes, "A large part of our operating success we attribute to Sinclair GASCON® D oil. It has given us an excellent rate of consumption while reducing wear. In fact, *cylinder and piston ring wear is much below normal based on other plants of equal capacity*. Something else we appreciate is the timely visits of the Sinclair Lubrication Engineers."

Top quality lubricants plus the assistance of Sinclair Lubrication Engineers are two of the reasons why Sinclair can play a large part in the success of *your* operation. Your local Sinclair Representative will be happy to explain the remaining reasons. Phone him or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

save Wear and Replacement

they will install in a 36-foot pleasure craft being built at their yard.

THOMAS E. HAND, Houston, will repower his auxiliary sail yacht *Stella* with a series 71, 3-cylinder General Motors diesel, driving through a 1½:1 hydraulic reduction and reversing gear.

BROOKS-JEAN Lumber Company, Shreveport, Louisiana, has bought from Waukesha Sales & Service, Inc., Houston, a 500 hp model LRD BSU Waukesha diesel which will furnish power for a drilling rig.

## Unusual Muffler Warranty

A warranty which promises to pay any fines imposed on a truck for exhaust noise in excess of legal limitations, stresses the silencing ability of a new line of replacement mufflers by the Donaldson Company of St. Paul, Minnesota. The warranty covers any recommended Donaldson muffler for a period of 6 months from date of installation. This new line of mufflers is designed for trucks of all types and horsepower—both gasoline and diesel. Claims are made that these mufflers will provide greater engine economy through better mileage and less engine maintenance. Manufactured from corrosion-resistant Armco Aluminized steel, these mufflers are said to provide long, trouble-free life.

Sales representation for replacement mufflers is being established immediately in states west of the Mississippi. Stocks of mufflers for all trucks will be established in all prime trucking centers. A special brochure describing Donaldson mufflers and rating them according to muffling ability is available to anyone who writes for it. Address Donaldson Company, Inc., 666 Pelham Blvd., St. Paul 14, Minnesota.

## Distributor for Barsad

The Gulten Marine Company, Inc., located at 455 Carroll Street, Brooklyn, N.Y. has been appointed distributor for Barsad, an alkaline fuel additive which reportedly reduces wear and corrosion in diesel engines. The firm also provides a technical service and will demonstrate the use of Barsad in solving problems connected with the use of heavy fuels, contaminated or low quality fuels.

## Orders 726 Diesel Generating Sets

A contract for 726 diesel generator sets has been awarded the John R. Hollingsworth Corp., by the U.S. Air Force. Hercules Model DIX-4D diesels with Roosa-Master fuel injection pumps are being used to power the 10 kw generators. The contract calls for designing, manufacturing, and testing the units to meet many special conditions.

The Hercules engines have 3-⅝ in. bore, 4 in. stroke, 166 cu. in. displacement. They are 4-cycle, rated at 1800 rpm to develop full required output from sea level to 6000 ft. elevation. Specifications require that the engines must operate satisfactorily on Military Fuel Spec. No. MIL-F-896 or jet fuel, grade JP4, Spec. No. MIL-F-5624, or kerosene Spec. No. VV-K-211.

Since it is required that injection frequency be held to plus or minus one-third of one per cent at any load within the prescribed range, the governor built into the Roosa pump has been modified to meet this condition. It also provides for an over-speed stop. Low lube oil pressure and/or high cooling water temperature controls also actuate the governor engine stop. The engines are equipped with Delco-Remy electric starters. The generating units are entirely enclosed in weatherproof housings with flush doors and extra large fittings to permit maintenance by men wearing bulky arctic gloves.

There's a Torcon unit to meet your job requirements

Here is a complete line of torque converters designed to meet a wide range of engine applications in all industrial fields.

The Clark Torcon unit is a three-element single stage converter of simple design, mass-produced. It is available off-the-shelf to owners and operators of equipment, as well as to manufacturers.

**HORSEPOWER RANGE**
**. . . 15 to 600**

**DIAMETERS**
**. . . 11" to 26"**

**COMPLETE CHOICE**
**of options for easy fit into practically any torque transmission system.**

CLARK EQUIPMENT

**This helpful bulletin describes TORCON advantages . . .**

***Send for it***

- **True Hydra-Foil Blade Design**
  —a patented feature. Correct combination of blade contour and angles assures smooth oil flow, for most efficient torque multiplication. No cavitation to cause turbulence or air pockets which impair efficiency and cause destructive wear.
- **Self-Contained Oil Circuit**
  —Sump is cast integral, and oil passages are cored in the housing. No unnecessary hoses and fittings; no external oil seals under pressure.
- **Easy Accessibility**
  —Inspection plates are easy to get at; no special tools needed.
- **Individually Cast One-Piece Elements**
  —no welds or fabrications to distort under extreme loads.

Every user of horsepower will find this bulletin well worth reading. The coupon brings your copy promptly—no obligation.

**CLARK EQUIPMENT COMPANY**
**Jackson 2, Michigan**

☐ Please send copy of The Torcon Bulletin

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Firm_____

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City_____ Zone_____ State_____

## Mississippi River News

*By* Dorothy Warren

FEDERAL BARGE LINES, INC. scheduled its first 1955 northbound tow out of New Orleans for St. Louis and Chicago Feb. 23 and the first scheduled run of the year out of Chicago for St. Louis and the Crescent City, March 8. A Federal boat will leave St. Louis on March 15 for Rock Island and March 25 for the Twin Cities.

ICE BREAKING on the Illinois waterway at Peoria started Jan. 25 and continued through Feb. under the direction of the U. S. Coast Guard service. Maintaining an open channel through ice measuring from 4 to 42 inches deep with gorges from 5 to 7 feet deep were four vessels with the aid of a helicopter. They were the Upper Mississippi Towing Corp. diesel towboat *Harriet Anne* (Fairbanks-Morse, 3,200 hp), diesel towboat *George Banta* (General Motors 2,200 hp), both under lease to the service, Coast Guard Cutter *Fern* from Dubuque (Fairbanks-Morse 960 hp).

OPERATORS report that ice conditions on the Illinois during the past winter were as bad as those in '51. This reporter remembers well that year having traveled from Chicago aboard the diesel towboat *R. H. McElroy* of the Pure Oil Co. in Feb. When the boat arrived in Memphis she still had a large cake of ice on her lead barge as a result of her ice battle in Lake Peoria freeing three imprisoned towboats. Recently she was re-named the *L. W. Sweet*. Built in 1950 by the Sturgeon Bay Shipbuilding and Dry Dock Co., she has twin 10-cylinder Fairbanks-Morse engines rated at 2,900 hp at 720 rpm.

TO MEET THE NEED of traffic on the Missouri river the Federal Barge Lines, Inc. will bring out a 3,200 hp (General Motors) towboat this spring. The 150-foot vessel built in the St. Louis Shipbuilding and Steel yard will have four 900 hp engines (Cleveland Division Model 567). It will be named for Lachlan Macleay, late president of the Mississippi Valley Association.

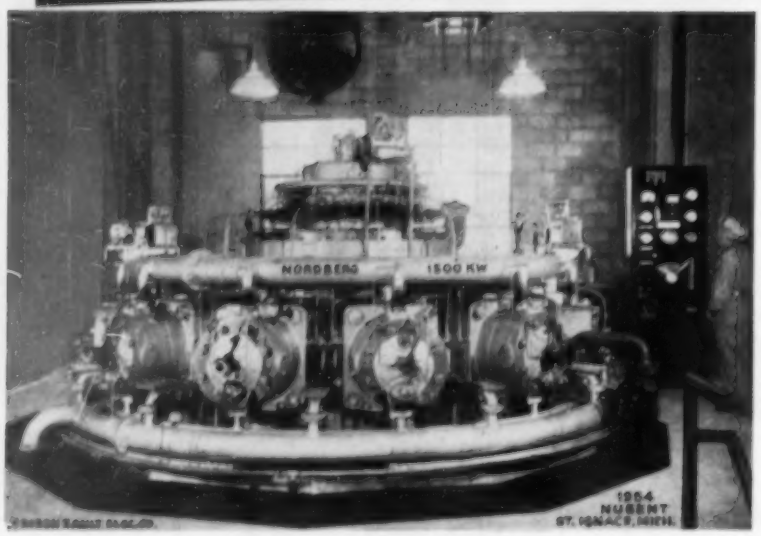
OPERATING under charter to the Misslou Towing Service, Inc., Mobile, Ala., is the new 3,600 hp towboat *Misslou* built by the Arnold V. Walker shipyard, Pascagoula, Miss. Two Fairbanks-Morse opposed piston engines of 1,800 hp propel the 116-foot vessel. Twin Collidge propellers are 4 blades each and there are two 100 kw generators.

NEWEST ADDITION to the towboat fleet of Coyle Line, Inc., is the twin-screw *Moss Bluff*, built in the Lockport Shipyard, Inc., Lockport, La. The 64-foot vessel is powered by two Buda diesel engines rated at 280 hp each continuous 1,100 rpm supplied by the Mechanical Equipment Co., New Orleans. The firm also supplied two 16 kw Buda diesel generators, 110 volt ac, one 3-hp firepump, one 2-hp bilge pump, 2 fuel oil transfer pumps and one 20 cfm Buda diesel-driven compressor.

TURNING IN A FINE performance on a 900-mile run delivering hot caustic soda from Houston to Tuscaloosa, Ala., is the new 3,200 hp towboat *Tuscaloosa* of the Coyle Line, Inc., New Orleans. Two Fairbanks-Morse opposed piston engines of 1,800 hp each power the 80-foot boat.

THE OHIO RIVER CO. new towboat *Mike Creditor* built by the St. Louis Shipbuilding and Steel Co. has two supercharged engines, Lima-Hamilton diesel engines, Baldwin model 606SC, 12½ x 12¾ x 15½ inches, 6 cylinder, 4 cycle units rated at 1,080 bhp at 600 rpm through Falk reverse reduction gears, having a ratio of 2.5 to 1. The engines and reduction gears are all pilothouse controlled.


**Nugent filters selected as original equipment at St. Ignace power plant**




Shown in the view above is a 1500 kw Nordberg Radial Diesel installed by the Edison Sault Electric Co. for municipal power service at St. Ignace, Michigan. Included as original equipment on this diesel was a Nugent Duplex Fuel Oil Filter of the type that removes 99.8% of all foreign solids from the fuel supply. The St. Ignace installation is still another example of Nugent filters being selected as original equipment by a leading diesel manufacturer.

*Nugent duplex fuel oil filter of the type used on the new diesel at St. Ignace. Bag type recharges are inexpensive and simple to replace.*

Nugent filters are available in a wide range of sizes and types to meet every need. Size for size they provide 20 times more filtering area than any other filter. Full or by-pass filtering is possible with the same unit and simple piping makes installation easy. These are some of the reasons why leading diesel manufacturers specify Nugent filters as original equipment.

To assure longer life and better service from your own diesel, investigate the possibilities of Nugent filtering. Write today for complete information.

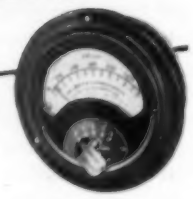
Wm. W. Nugent & Co., Inc.
415 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Established 1897



**ADVANCE WARNING ...against engine damage**



***How much*** **of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?***

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

**Cylinder Overload** **Preignition**
**Scaled Jackets** **Clogged Ports**
**Detonation** **Faulty Injection**

Get the best from your diesel—minimum fuel consumption per horsepower and long service uninterrupted by foreseeable breakdowns. Get constant protection of your engine, cylinder by cylinder, with an Alnor engineered Exhaust Pyrometer System.

***Get Full information—Quickly!*** Your nearby Alnor Diesel specialist is conveniently listed in the classified directory. Ask him to help you select the Pyrometer and thermocouple assembly designed for your engine. Or send for Bulletin 4361 with complete details of the full Alnor line of Pyrometers.

**ILLINOIS TESTING LABORATORIES, INC.**
**Room 508, 420 N. La Salle St., Chicago 10, Illinois**

POWERED BY a 100 hp Caterpillar diesel engine, the towboat *C. J.* is towing the Aurora ferryboat across the Ohio at Aurora, Ind. The sidewheel ferryboat *Everett Lee* was converted into a barge now towed by the *C. J.*

MARINE PROPULSION for the new tugboat *Esso Oranjestad* is by a General Motors diesel engine developing 1,500 hp. The $500,000 tug built in the yard of Gulfport Shipbuilding Corp., Port Arthur, Texas, is now in operation in Aruba, Dutch West Indies for the Largo Oil and Transport Co., a Canadian subsidiary of Standard Oil Co. The vessel is 105-feet in length.

CONTROLLABLE pitch propellers are being manufactured by Allis Chalmers and the Bird Machine Co., South Walpole, Mass., for installation on tugs, ore carriers and similar vessels. These hydraulically operated propellers eliminate the need of reversing gears and provide a means of securing maximum engine efficiency. The first pair of controllable pitch propellers was installed in the twin-screw tanker *Martha E. Allen* of the Lake Tankers Corp.

A NEW TOWBOAT powered by two new 16-cylinder General Motors (Cleveland Division) 278A diesel engines will be delivered by Nashville Bridge Co., Nashville, later in the year to the Potter Towing Co., Uniontown, Ky. Hull dimensions will be 135 x 35 x 10½ feet. The boat will be similar to the towing firm's *Mama Lere*.

A NEW FIRM, the Huffman Towing Co., St. Louis, is now operating the towboat *Havana Zephyr* in cement movements for the Missouri Portland Cement Co. Built by St. Louis Shipbuilding and Steel Co., in 1945-46, this craft was a forerunner of streamlined styling in towboats. She has twin National Superior diesels totaling 2,000 hp. Her length is 129 feet with a 29 foot, 9 inch beam.

OPERATING out of St. Louis into the Illinois Waterway this winter under charter to the S. and S. Towing Service of Joliet, Ill., was the Federal Barge Lines, Inc., *Franklin D. Roosevelt*. Built in Midland, Pa., in 1933, the towboat, 148.7 x 40 x 8 feet is equipped with two McIntosh and Seymour diesel engines rated at 1,100 hp at 300 rpm.

THE TOWBOAT *Camilla*, powered by a Cooper-Bessemer diesel rated at 800 hp at 450 rpm, has been purchased by Igert Inc., of Paducah from the Chemical Lines, Inc. The name has been changed to *Emma V.* It will operate in the Tennessee River trade. The 102.9 foot vessel was built in 1942 by the Nashville Bridge Co.

TWO 6-71 GENERAL MOTORS (Detroit) diesel engines will power a steel harbor boat being completed for Cargo Carriers, Inc., by the Standard Boat and Motor Co., St. Louis. The engines operating in tandem will develop 300 hp.

THE SIOUX CITY and New Orleans Barge Line expects to have a new towboat delivered at Houston on or before March 15. The vessel will be all steel, twin-screw, 3,200 hp, 140 x 38 feet and 7 inches.

ANOTHER towboat sold recently was the 160 hp *Royce Patton*. New owners are Capt. John B. Ritchie of Cape Girardeau and Capt. Clarence L. Ritchie of Paducah, who will form a company or partnership to engage in harbor towing.

## Water Cooled Air Compressors

The complete line of Quincy water cooled air compressors is described in a new 8 page folder. Included are all features, dimensions, and specifications. To obtain detailed catalog sheet, write Quincy Compressor Co., Quincy, Illinois for form 1000A.

Typical installation of American Hammered Conformable Oil Rings

**Insures constant unit pressure for positive oil control!** You keep your oil consumption down when you install Koppers American Hammered Conformable Oil Rings! This service-tested piston ring conforms readily to meet cylinder distortion because its flexible cast iron member is pressed outward by an abutment type spring which exerts uniform radial pressure around the entire circumference.

Narrow bearing surfaces on either side of the channel give the ring a uniform unit pressure on the cylinder, enabling it to seat promptly and assuring maximum removal of excess oil throughout its lifetime. And the Conformable Oil Ring has a longer useful life because its low spring rate and uniform lands result in negligible changes in pressure as the ring wears

Easily installed, it is ideal for both 2-cycle and 4-cycle Diesel & Gas engines; comes in 4" to 25" diameters with a minimum width of ¼". Write, wire or phone us today for full information on how the Conformable Oil Ring can improve *your* operation . . . or for expert help in *any* piston or sealing ring problem. KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1586 Hamburg Street, Baltimore 3, Maryland.

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This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers-Elex Electrostatic Precipitators and Gas Apparatus.

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**Briggs** PIONEERS IN MODERN OIL FILTRATION

**OIL FILTERS *are specified by Fairbanks-Morse for the most powerful and largest ice breaker afloat . . . the new* U.S.S. GLACIER.**

Photo Courtesy U. S. Dept. of Defense

**WHEN IT'S A TOUGH JOB TO BE DONE RIGHT . . .**
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**When quality and performance are essential . . . and where absolute dependability are part and parcel of the job, engineers and maintenance men take their filtration problems to BRIGGS.**

**WRITE, WITHOUT OBLIGATION, IF YOU HAVE A "TOUGH NUT" TO CRACK. WE WILL BE GLAD TO WORK OUT ANY FILTRATION PROBLEM YOU MAY HAVE.**

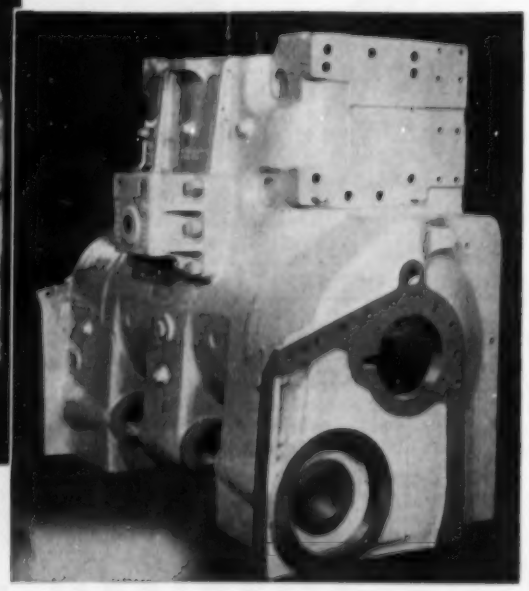
**For over a quarter of a century BRIGGS engineers have delivered sound filtration answers to those who demand dependability and know-how.**

YOU CAN ENTRUST THE LIFE OF YOUR FINEST EQUIPMENT TO

**THE BRIGGS FILTRATION CO., RIVER ROAD, WASHINGTON 16, D. C.**

**Briggs** PIONEERS IN MODERN OIL FILTRATION

**BEFORE**



**and AFTER**

*This apparently hopelessly broken D8 transmission case left our shop after a few days in "as-new" condition and ready for another lifetime of work.*

**A valuable and important piece of equipment, as a consequence, was quickly placed back into service at a fraction of the part's replacement cost. Another example of GUTH-PASCOE restoration work.**

**All ferrous and many non-ferrous castings (aluminum included) can be restored at substantial savings by the GUTH FUSION PROCESS no matter how badly damaged. Size and complexity is no obstacle. Castings are returned to original specifications. It will pay you to investigate GUTH-PASCOE. On your next job, give GUTH-PASCOE the break!**

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**EMERGENCY** **rush service day or night . . . Sundays and Holidays included**

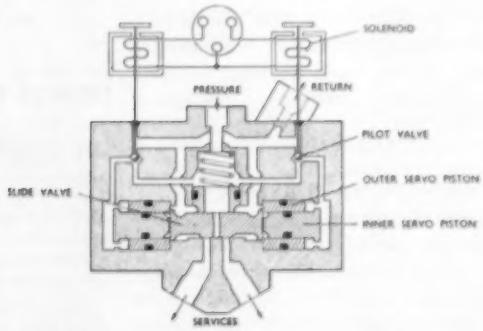

## European Diesel News

*By* Hamish Ferguson

DIESEL TECHNICAL SERVICES. At a time when diesel engines and gas turbines are becoming increasingly popular, both in Great Britain and throughout the world, it seems that there are many engineers and potential users who are wanting to know more of their possibilities. To cater for those requiring guidance and information, both in England and elsewhere, an advisory consultant service has been formed known as Diesel Technical Services with offices at 2 Northcote Avenue, Ealing, London, W.5.

BRITISH RAILWAYS REORGANIZATION. Details have been announced of a complete reorganization plan for British Railways, to be carried out over a period of 15 years. Basis of the plan is the complete elimination of steam locomotives and their replacement partly by motor-driven locomotives running over electrified lines and partly by diesel locomotives and railcars. It has been estimated that a total of more than 2,000 diesel locos and cars will be coming into operation as the scheme develops. The program should give considerable encouragement to the British manufacturers of diesel railway equipment who have had, up to now, to rely largely on the export market for this branch of their business.

DOWTY "HYDEL" VALVE. Dowty Equipment Ltd., of Cheltenham, have produced a new 4-way selector valve suitable for the control of liquids and showing high rates of flow with low pressure drop. Type 4600-Y can operate at pressures up to 4,000 psi with a flow of 20 gal/min. It is light and compact, measuring only 5.16 by 3.93 by 3.90 in. overall. The selector employs a slide to control the direction of flow. The slide is moved into its required position by pilot valve controlled servo pistons. The pilot valves are steel balls held between conical seats. Pressure normally keeps the pilot inlet-ports open, but, by energizing one solenoid, one servo cylinder is connected to return.




This allows the central servo piston on the opposite side to push the slide into one of its operating positions. With the solenoid de-energized pressures in both servo cylinders are in balance and due to the arrangement of the stops acting on the outer servo pistons, the slide is moved back into the central position. The solenoids are quickly detachable and are suitable for continuous operation in all climatic conditions. In case of failure of the electric supply, the slide will move to the central position, thus maintaining pressure in the circuit selected. For test purposes, the valve may be operated by depressing flexible caps protecting the solenoids.

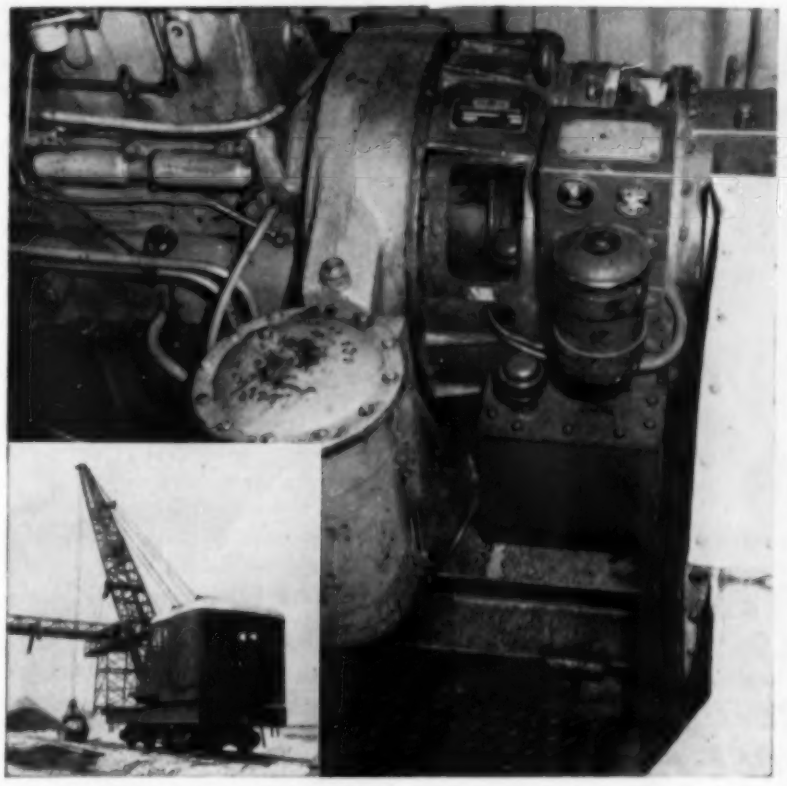
R. L. ENGINEERS LTD. A new Company, R. L. Engineers Limited, has been formed by the Rootes Group and R. A. Lister & Co. of Dursley. It is recognized that the long established uses of diesel engines in the industrial, electrical, locomotive and marine fields have called for types and specifications substantially different from those required by the automotive applications. The intention of the Board of the new Company is to insure that overlapping is eliminated and the most effective engineering and selling costs obtained.

25 YEARS OF FLUIDRIVE. This year the Fluidrive Engineering Co. Ltd. Worton Road, Isleworth, Middx., celebrate the 25th anniversary of their formation. Commencing under the name of the Hydraulic Coupling & Engineering Co. Ltd., and using the principles of the Vulcan Coupling dating back to 1905, the Vulcan-Sinclair fluid coupling was developed. Since that time a great many improvements have been made and today it is claimed that over four hundred established applications have been catered for. For diesel railway work, the first locomotive to be fitted with a fluid coupling was pioneered by Hudswell Clarke & Co. Ltd., of Leeds, in 1930. Powered by a McLaren-Benz engine developing 300 hp at 1,000 rpm, the drive was taken through a Vulcan-Sinclair fluid coupling of the ring-valve type to a David Brown 4-speed gearbox. The latest development for the railways involves the use of Paxman "Hi-Dyne" engines, Dual Fluidrive and Synchro-Self-Shifting (SSS) gears. It is stated that these engines give an almost constant horsepower output and hence a most desirable tractive effort/speed curve is obtained with the highest overall efficiency.

On the marine side, the first fluid coupling was used for transmitting the power of a Petters diesel developing 75 hp at 375 rpm to the stern wheel of a shallow draft vessel. A recent application has been the equipping of the Admiralty's newest survey ship, H.M.S. *Vidal*, where the main propulsion units are twin diesels of Admiralty design. The fluid couplings are used in conjuction with a Modern Wheel Drive oil-operated reverse-reduction gearbox.

Among the industrial applications, large numbers of fluid couplings have been used for taking the drive to power station fans, to serve as slip regulators for flywheel generator sets, for feed pumps in powers up to 2,500 hp, particularly in the U. S. A. through the Vulcan-Sinclair licencees, the American Blower Corporation. Other uses are for conveyors, excavators, road rollers and drilling rigs. Fluidrive also played an important part in the development of the fluid coupling for vehicles, first known as the fluid flywheel. In 1933 Daimler cars and A. E. C. buses were being fitted with fluid couplings, and in 1938 the Chrysler Corporation of Detroit introduced it in their Crown Imperial.

LIGHTWEIGHT DIESEL TRAINS. The North Eastern Region of British Railways has announced the results of the first 3½ months' operation of lightweight diesel trains. It has been found possible to run more frequent services due to the greater flexibility of the diesels, and on the inter-urban lines in Yorkshire some additional 120,000 passengers have been carried, showing an increase in revenue of over £10,000 during the period.

Model F Torque Converter behind Cummins HBI-600 powering "Green Hornet" at Missouri, Illinois Material Co., one of leading aggregates producers in St. Louis area. Twin Disc Torque Converters are provided in 3 types, with capacities up to 650 hp.

**Diesel power with torque converter cuts fuel costs 50% on "Green Hornet"**

With an old locomotive crane affectionately dubbed the "Green Hornet", Missouri, Illinois Material Co. of St. Louis is realizing drastic savings, outstanding performance . . . from a Cummins Diesel conversion unit working through a Twin Disc Torque Converter.

With a 1½-yard bucket, the crane is loading 300 tons of sand an hour on 2½ to 3 gallons of fuel . . . averaging less than *half* the fuel costs per day than with coal. And on boiler-cleaning *alone*, the conversion unit is saving $676 a year on labor.

Through the powerful and infinitely-variable torque multiplication of the Twin Disc 3-Stage Torque Converter, the "Green Hornet" is throttle-controlled. No clutch is used. The only governor is for over-speed. Gross overall reduction is 3.75:1. With a line speed of 168.75 fpm, the crane pulls 21,334 pounds. The owner reports "a swift but soft power build-up during acceleration with no lugging or vibration, and no cable-whipping or bucket-swinging during deceleration. And it's *convenient*. For emergency orders, we just punch the button and *go*."

Such performance and savings facts are similar to *hundreds* of power unit conversions with Twin Disc Torque Converters. *See your engine dealer.*

TWIN DISC

TWIN DISC
Torque Converters

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"211"

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STRATOFLEX 211 Hose is designed for a wide range of industrial uses. Its flexibility, small bend radii, durability, and light weight afford time-saving installation and long service. Complete line of detachable fittings available. Order from your local dealer or write for free catalog.

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## Low Pressure, Direct Lift Solenoid Valve

A new direct lift, solenoid-operated, packless valve, designed for low pressure application up to seven psi, has been made available by the Automatic Switch Company, Orange, N. J., in ⅜-in. and ½-in. pipe sizes. The new valve (Bulletin 8030A) features simple construction, the only moving element is a stainless steel core and composition disc, housed in a heavy duty, forged brass body.

## 1955 Orders Top 1954

Beatty Williams, chairman of the board of Cooper-Bessemer Corp., in his annual report, states: "New orders received in January and February totaled more than five million dollars, as compared with three million for the corresponding period of the year 1954."

## Pipeline Financing Starts

Pacific Northwest Pipeline Corp. has taken an initial step to finance its $163 million construction program for its proposed 1446-mile natural gas line from Colorado to the Pacific Northwest. Officials registered with the Securities and Exchange Commission $17,220,000 of 6% interim notes and 287,000 shares of common stock.

## Director of Advertising

Richard H. Koehler

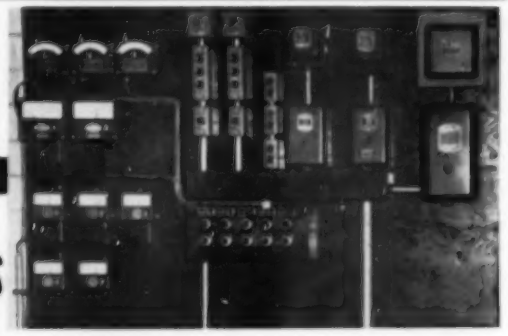
Richard H. Koehler has been appointed director of advertising and publicity for Westinghouse Air Brake Company. He moves up from the post of advertising and sales promotion manager at the company's Le Roi Division in Milwaukee, Wis. He begins his new work with the parent company the 1st of April, head-quartering in Pittsburgh, Pa. He will supervise and coordinate all advertising and public relations activities.

## Western Regional Manager

C. H. Morse, Jr.

Mr. V. H. Peterson, vice president – Railroad Sales, announced the appointment of Mr. C. H. Morse, Jr., to the position of western regional manager, Railroad Division, effective immediately. In this position Mr. Morse will have responsibility for the sale of all company products to all railroads in the Middle and Far West. Mr. Morse has held a number of positions in the Railroad Division these past years, having been successively manager of Locomotive Sales, Chicago area; assistant manager, and for the last four years manager of the Locomotive Service Department.


17 YEARS
and STILL on the JOB!



More LEVELOMETER GAUGES
INCLUDED IN
AGRA LITE REA Plant Expansion
proof that LEVELOMETER Gauges are Dependable

Night and day since 1938, when Agra Lite began supplying power to over 4000 Minnesota consumers, Levelometer gauges have maintained careful, constant watch over the fuel level of its giant diesel storage tanks. For over 147,000 hours, these same Levelometers have continued their precise task — precise only because of their high degree of engineering perfection.

And when Agra Lite expanded its facilities, side by side with the original gauges, another battery of Levelometers was installed. Why was Levelometer specified again? Because REA engineers want dependability and durability—watchwords in liquid level indication.

LIQUIDOMETER INSTRUMENTS

THE LIQUIDOMETER CORP.
36-24 SKILLMAN AVE., LONG ISLAND CITY 1, N. Y.

## "Hi-Pop" Injector Valve Spring

The Saco injector valve spring for GM diesel models "71," "110," etc. has been improved to deliver over 950 pounds pop pressure when assembled with new parts and 25 to 33⅓% more than ordinary springs when assembled with old parts. "Hi-Pop" assures better performance with longer life of old parts. Saco also offers new, genuine parts for General Motors, Detroit Diesel and Gray Marine "71" engines. Their complete listings and price list will be mailed on request. Write direct to: Saco, 2637 Cottage Grove Ave., Chicago 16, Illinois.

## New Type Diesel Lubricant

A new type railroad diesel lubricating oil has been released to the marketing groups of Cities Service, W. W. Scheumann, vice president, Cities Service Research and Development Company, announced. This new oil is made from selected high-viscosity-index, chemically balanced stocks and has been tested in over 30 million miles of railroad operation. It contains a selected additive to assure completely satisfactory performance under conditions of heavy-duty service, high sulphur and low-octane-number fuels.

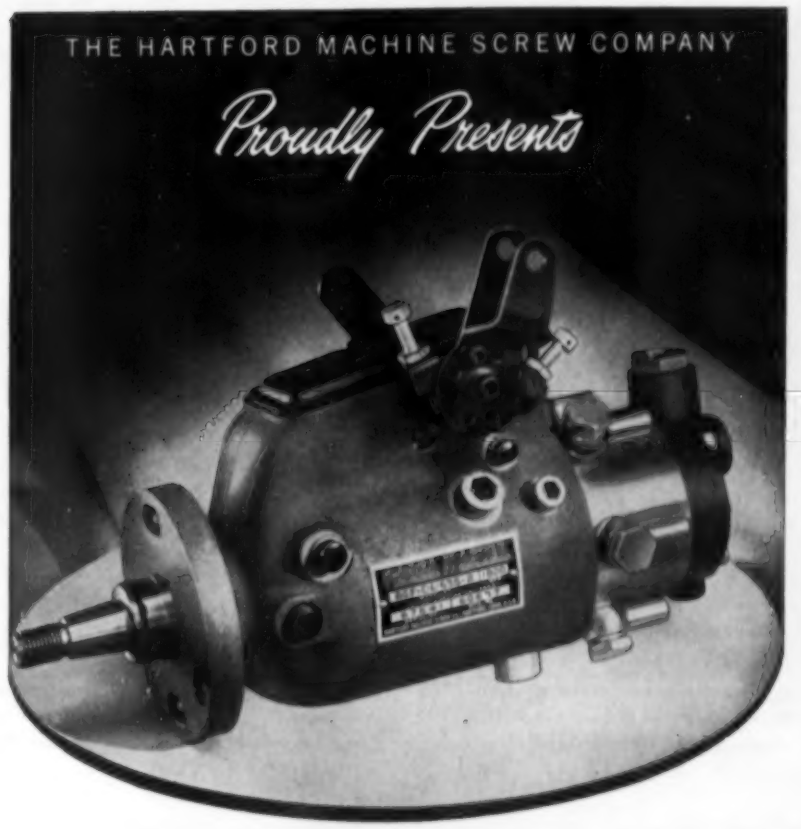
With an eye to the future, Cities Service petroleum engineers have perfected this oil for proper lubrication of diesel engines geared for a higher output than those in operation today. Road tests made of this new lubricant under heavy-duty service, according to the manufacturer, have shown up to a 20 per cent saving in oil consumption. Its anti-wear properties are also superior to conventional-type railroad diesel oils currently in use. A spokesman states that this new Cities Service product has already won the approval of the major railroad diesel engine builders, as a lubricant for their engines in railroad service.

## Two Appointed To Sales Posts

Bruce W. Carkin

Bennett T. Church

Two new appointments to home office sales posts has been announced by W. B. Watterson, vice-president in charge of sales for the Air-Maze Corporation, 25000 Miles Road, Cleveland. The company is one of the nation's leading manufacturers of air and liquid filters. Bruce W. Carkin has been appointed sales engineer of railroad and original equipment installations. He was formerly associated with the Electro-Motive Division of General Motors Corporation, LaGrange, Illinois, in the design and development of railroad locomotives. Mr. Watterson also announced that Bennett T. Church has been named manager of distributor sales. He previously served with Harvey Whipple, Inc., Springfield, Mass., as a factory representative.


THE NEW

**ROOSA MASTER MODEL "B" PUMP**

*Another Great Advance*

IN SIMPLIFIED DIESEL FUEL INJECTION

Another "first" for Roosa Master, the new Model B Diesel Fuel Injection Pump is . . . lighter . . . smaller . . . and more compact . . . yet retains the pace-setting simplified method of fuel injection pioneered by Roosa Master Model A. The new Roosa Master Model B offers both the diesel engine manufacturer and user outstanding performance, exceptional dependability and lower maintenance costs through easier servicing. Write today for complete information.

HMS ROOSA MASTER

DIESEL FUEL INJECTION AT ITS VERY BEST

THE HARTFORD MACHINE SCREW COMPANY • HARTFORD 2, CONN.

## Adds To Parts Cleaning Machine Line

Storm-Vulcan, Inc., Dallas, Texas, announces a new addition to their complete line of Turbo-Blast parts cleaning machines for automotive and industrial application. This machine is Model #40 which is designed for utilization of a small working area, unobstructed working area on the sides and front, with volume cleaning capacity. This parts cleaner is only 40 inches from the floor which makes loading and unloading fast and easy, saving valuable work time. It is claimed that the super agitation created by two powerful impellers is equal to vigorous hand-scrubbing. Two parts baskets hold a capacity of 3 to 5 motor blocks at one time, cleaning time for this capacity is within a 20 minute period.

The Model #40 Turbo-Blast parts cleaner has a tank size of 5 ft.x3 ft.x2 ft. (solution fills to 18-in. deep); heating of the solution is by gas or steam; solution capacity is 185 gallons; impellers driven by two 1½ hp single phase motors. Catalog and complete information available from Storm-Vulcan, Inc., 2225 Burbank St., Dallas, Texas.

## Efficiency Award To Be Made

Since 1951, DIESEL PROGRESS has had the pleasure of awarding the DIESEL PROGRESS Efficiency Plaque to the most efficiently operated REA internal combustion generating plant of the year. Again, this year, at the Annual REA Electric Generating Plants Operation and Maintenance Conference, Rex W. Wadman, editor and publisher of DIESEL PROGRESS, will present the award to the prize-winning plant.

The contest was originated by DIESEL PROGRESS as a means of fostering the over-all efficiency of this large group of diesel, dual-fuel and gas engine users. Selection of the winning plant is based on information forwarded to the Rural Electrification Administration in Washington, D.C. The method of computing the efficiency of each plant takes into consideration the differences in fuel costs and other such variables.

The Efficiency Award will be made to the plant manager of the winning plant at the first day's session which will take place in the Shirley-Savoy Hotel in Denver, May 2 through May 5. Previous winners of the award are the Graham County Electric Co-op of Pima, Arizona and the Wolverine Electric Cooperative, Hersey, Michigan which won it two years in succession.

A complete and detailed description of this year's winning plant will appear in the May issue of DIESEL PROGRESS.

## Compressor Stations

Two compressor stations are utilized by the Rowan Oil Co. to compress natural gas which is utilized to gas-lift oil wells on a lease near Danbury, Texas. Each consists of a Superior G-510 engine, made by The National Supply Co., together with two Worthington compressors. The compressors are driven off a 23-groove sheave carried on a 4½-inch driving shaft and coupled to the stub-shaft with Falk 16F standard steel-flex coupling. A Woods clutch is used. Air-cooled intercoolers are inserted between the stages of compression.

## Portable Re-Fueler for On-The-Job Field Use

The advantages of keeping equipment re-fueled on the job are too apparent to mention here, but the

advantage of clean dirt-free fuel, serviced on the job, is of vital importance where labor charges and work performance are considered. The Briggs portable re-fueler can be used anywhere. It is comparatively light in weight, wheels freely over gravel, dust and rugged terrain. One man can operate its 10 gpm self-priming hand pump and thus return the truck or trailer to productive employment quicker than sending the truck to a too distant refueling point. The portable re-fueler can be used on a fuel truck or on the ground. The oil is "full flowed" through a Briggs A-428 full flow, disc-pac, filter cartridge, housed in one of their widely used D-1 tanks. The compact unit is mounted on a two-wheel dolly with wide surfaced wheels so that it can be pushed easily from point to point. The patented A-428 full flow, disc-pac, filter cartridge has been successfully used by railroad and industrial organizations for years.

The company has prepared a pamphlet on the portable re-fueler, and it can be obtained by writing to them. Address inquiries to The Briggs Filtration Company, River Road, Washington 16, D. C.

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Diesel Men Who Drive Themselves!

If you need one or more trained Diesel mechanics, our Placement Service can send you the energetic kind that every employer dreams about—fellows who *drive themselves* . . . These are men who have *proved* they have the inner drive by investing hundreds of hours and hundreds of dollars of *their own money* for Diesel training, and are now eager to go to work at any Diesel job, anywhere you say. Just tell us your requirements, and we will endeavor to supply the men to meet them.

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GASKETS AND SHEET PACKING
FOR OIL, WATER AND GASOLINE
THE VELLUMOID COMPANY WORCESTER 8, MASS.

## New Orleans Diesel News

*By* James W. Calvert

FAIRBANKS, Morse & Co. has sold a 6 kw model 45B4½ diesel driven lighting unit to the Great Lakes Dredge & Dock Co. at Morgan City, La.

GEORGE Engine Co., Harvey, La., has delivered a GM model 30-31 diesel unit to Southern States Equipment Co. for powering an American hoist for J. Ray McDermott & Co., also of Harvey.

INGALLS Shipbuilding Corp. of Pascagoula, Miss. recently purchased four 200 kw model 38 Fairbanks, Morse & Co. generating sets.

THE FIRST triple-screw crew boat to be put into operation in the offshore oil fields of Louisiana was recently delivered to Tripod Boats, Inc., of Berwick, La. The *Tripod*, built by Sewart Seacraft, Inc. of Morgan City, is powered with three series 71 6-cylinder GM diesel engines and is capable of 25 miles per hour, with a loaded cruising speed of 22 miles per hour. It is certified by the U.S. Coast Guard to transport 22 persons.

TWO 960 hp model 38D8-⅛ Fairbanks-Morse marine diesel engines have been sold to Coyle Lnes, Inc. for installation in the tug *Alamo*.

EQUITABLE Equipment Company of New Orleans has delivered one of its Equity Standard 45 ft. tugs to Bath Iron Works. The tug is powered with a GM 6-110 diesel engine.

SOUTHWESTERN Louisiana Institute, at Lafayette, La., recently purchased a 2 cycle model 49B½, 58 hp, 1800 rpm diesel unit from Fairbanks, Morse & Co.

CONSTRUCTION Aggregates Corp. of Venezuela has purchased a 42-ft shallow draft tug boat from Equitable Equipment Company of New Orleans. The diesel engine, a GM model 6-110, was sold by George Engine Company of Harvey, La.

A 39-FT TWIN screw offshore crew boat, powered with two 6-cylinder series 71 GM diesel engines, has been delivered to Hutton Marine Service of Baton Rouge by George Engine Co., Harvey. The vessel has been chartered to a major oil company.

CALMES Engineering Co., New Orleans, has just installed GM diesel engines, to power two Watrous barge cargo pumps on new oil barges for one of the major oil companies operating in the offshore fields off the Louisiana coast.

GULF Master Boats, Inc., Slidell, La., has completed a 40-ft twin screw oil field crew boat for O'Neil and Tahan of Abbeville, La. The vessel is powered with two GM model 671 diesel engines, sold by George Engine Co., Harvey.

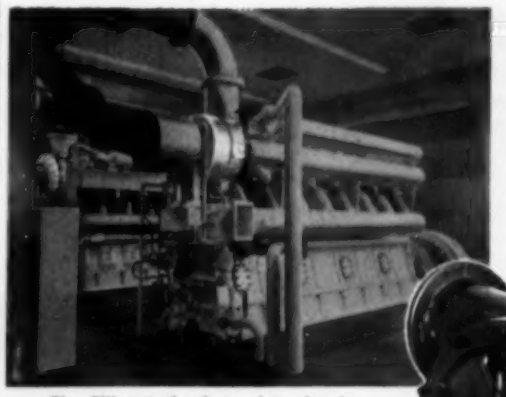
### Engine Production Increased

R. E. Huthsteiner, president, Cummins Engine Co., Inc., Columbus, Ind., states that his firm increased its engine production rate March 1. The new schedule is the highest in the company's 36-year history, about 17% over recent highs. Acceptance of the Cummins PT fuel system; introduction of a line of Cummins Turbodiesels; increasing usage of small, lightweight diesels; and an expanded distribution plan were given by Mr. Huthsteiner as reasons for the production step-up. He also said that a 60% expansion of the company's research facilities will be completed by approximately May 1.

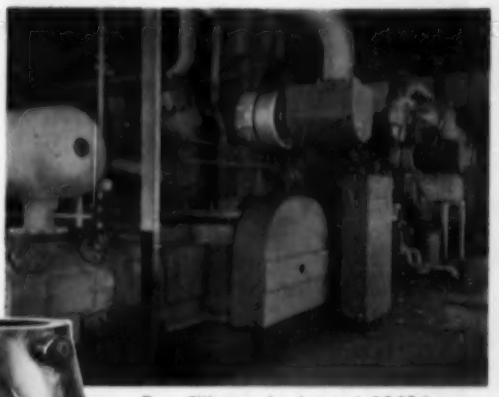
### Product Engineer

Wayne Howard, former vice president of engineering, Torcon Corporation is now product engineer with Clark Equipment Company.


**You can count on ELLIOTT turbocharging!**



The Elliott turbocharged engine in the foreground is a recent addition in this municipal plant. Earlier Elliott model in background.



Two Elliott turbocharged 1350-hp engines on the job in a natural gas company pipe line station in the Southwest.

Elliott turbocharger in modern municipal plant. In the rear are three other Elliott turbocharged engines.

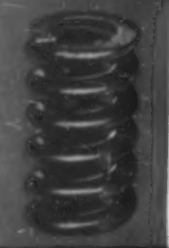
This 2120-hp engine in a diesel-generating power station gets a boost from the Elliott turbocharger.

**EXPERIENCE MAKES THE DIFFERENCE...**

It has been proved that turbocharging improves almost any diesel engine. It permits the engine to deliver more horsepower at lower fuel consumption. But be sure the turbocharger is an Elliott—the only turbocharger backed by 15 solid years of experience. Hundreds of thousands of hours of reliable operation in more than 12,000,000 hp of Elliott turbocharged engines on railway, marine, on-and-off highway trucks, stationary and heavy duty construction service stand behind today's product. It pays to specify Elliott turbocharging whenever you invest in diesel powered equipment. For complete details, write Elliott Company, Supercharger Department, Jeannette, Pa.

**ELLIOTT Company**

THE AMAZING NEW
"HI-POP"
INJECTOR
VALVE SPRING



For GM Diesel
Models "71", "110", etc.
Delivers over 950 pounds pop pressure when assembled with new parts — 25% to 33⅓% more than other springs when assembled with old parts.
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IMMEDIATE
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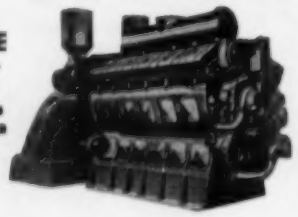

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Voltages

Write or wire today for bulletins and complete information regarding these fine fully guaranteed, low cost DIESEL ENGINE GENERATING UNITS. Visit our plants at Sausalito (S.F.), California, and Eddystone, Pa., and see units in operation on our test stand.

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## High Speed Earthmoving

**An International TD-24 gives a push-loading assist to an International 2T-75 tractor-scraper combination on a Kansas relocation project.**

High-speed spreading of fill material by dieselized equipment aided contractors make a fast relocation of US 383 near Prairie View, Kansas. This busy highway had to be moved because adjacent Prairie Dog Creek frequently overflowed its banks and snarled traffic.

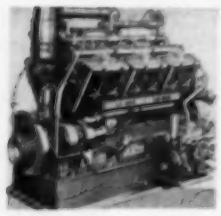
Approximately 420,000 cu. yds. of earth and 87,700 cu. yds. of unclassified material was moved in grading the project. This furnished a roadbed for a 32-ft.-wide asphalt surface. Most of the unclassified materials, primarily limestone was ripped by one of the five International TD-18A crawlers belonging to BP & VP Construction Co. Two cuts, requiring 52 ft. of excavation, accounted for the majority of earth yardage moved. The cuts were adjacent to long fill areas and most hauls therefore were short. In other fill areas, borrow material was yellow clay obtained from pits within the 150-to-300-ft. right-of-way. Average earth-moving hauls covered a 6000-ft. cycle.

Equipment was divided into two sections. The first unit consisted of two International 2T-75s, one TD-24 used as a pusher, an International 19 industrial wheel tractor and compactor, an Adams 610 motor patrol, and three 5000-gal. water wagons. These machines handled the long-haul work. The other unit had two International TD-18As for dozing and rock ripping, two TD-18As with scrapers, a TD-18A pusher, a compactor and grader. This unit handled short hauls in deep cuts and high fills.

## Illustrated Bulletin

Lister marine diesel engines with one to six cylinders and 9 to 54 bhp at 1800 rpm are presented in a 4-page illustrated Bulletin No. 448 by The National Supply Co., Pittsburgh, Pa. Design features, accessories, performance curves, and dimensional diagrams are included.

## New Le Roi Catalog



Just published, a bulletin describes the 115 to 410 horsepower Le Roi L3000, H2000, and F1500 engines. The eight page bulletin uses cutaway views and photographs to show advanced features such as modern valve-in-head design. This design incorporates a more nearly perfect combustion chamber producing more horsepower per fuel dollar. Some of the other features discussed include: Full length guided valve stem mechanisms, light-weight cam ground aluminum pistons, drop forged crankshafts with polished bearing surfaces, full flow pressure lubrication, and conveniently located controls.

Copies of this catalog, No. E-9 can be obtained by writing to: Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Company, 1706 South 68 Street, Milwaukee 14, Wisconsin.

## Transfers Main Office

E. G. Duerk, general manager for Florida Diesel Engine Sales, Detroit Diesel Engine Div., General Motors Corp., announces the transfer of the main office from Jacksonville Fla. to 2315 No. West 14th Street, Miami, Fla. According to a statement from Mr. Duerk the move was necessitated by a greatly increased sales volume along with the increase of industry in So. Florida plus the excellent facilities at the Miami branch.

The new shops, when completed, along with the present shops, docks, ways and offices will give Florida Diesel Engine Sales one of the largest and finest facilities for a diesel engine distributor in the State of Florida. This branch with a competent staff of over 30 persons includes E. G. Duerk, general manager; Dale Skogg, state service manager; and Ralph Bethea, state parts manager.

REFINE YOUR WASTE OIL!
Oil Re-refiner, new, mfg. Youngstown-Miller, cost $6,000. Will sacrifice for $2,400. Purifies all types waste or used oil.
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OPENING FOR DIESEL SALESMAN
West Coast firm offers excellent opportunity for man with successful experience in sale of large diesel electric generator sets for stationary use. Must be free to travel. Salary open. All replies will be held in strictest confidence. Write DIESEL PROGRESS, File No. 515, Cole Station, Los Angeles 46, California.

Grinding and Hard-Chrome Plating of Diesel Engine Crankshafts

ALL SIZES
Complete facilities for grinding, plating, Magnafluxing and electrically controlled heat treating.
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## Oil Seal Catalog

Asserted to be the most complete catalog on oil seals available to industry, the new Albert Trostel Packings, Ltd. catalog consists of 100 pages of data. The information covers 20 types which can be had in 100 styles of small design variations with well over 4,000 standard sizes listed.

These seals include the metal cased seals which can be had in leather and synthetic rubber and the simpler designed bonded seal where the synthetic rubber sealing member is bonded to the outer metal case. This book also describes especially made seals for various bearing applications in a tailor fit new design.

The publisher of the book, Albert Trostel Packings, Ltd., Lake Geneva, Wisconsin is making the book available free of charge but requests that because of the costs involved that only people connected with original equipment manufacturers apply for it.

## International Railroad Motive Power Conference

An International Conference on Railroad Motive Power, sponsored by the Association Des Ingénieurs Sortis de l'Ecole de Liége, Belgium will get under way April 25th and close April 28. The Conference has been organized on the occasion of the International Fair of Liége.

The projected program will cover all types of Railroad motive power and the various types of drives by many international experts. Among those contributing to the discussion will be a top representative of Baldwin-Lima-Hamilton Corp. His subject will be "The Proper Use and Maintenance of Equipment."

Free information on the Conference is obtainable by writing the Secrétariat des Journées Internationales de la Traction dans les Chemins de Fer, 22, Rue Forgeur, Liége, Belgium.

## National Sales Organization

Amerigear-Zurn, Inc. has been formed in Erie, Pa. as the national sales organization for the flexible couplings and allied power transmission products made in that city by the American Flexible Coupling Company. According to John Henry Zurn, vice president for sales of American Flexible Coupling, both the manufacturing and marketing companies are affiliates of J. A. Zurn Mfg. Co., Erie, Pa.

American Flexible Coupling Company was established in 1929 as manufacturers of American-type flexible couplings. Since that time it has designed, manufactured and marketed a wide variety of standard and special geartype couplings and power transmission products employing the patented Amerigear fully-crowned tooth form. One of its most recent developments is a synchronizing clutch-coupling for engaging and disengaging the main propulsion plants on the first atomic submarine *U.S.S. Nautilus*.

American Flexible Coupling Company is closely supported in its work by the Zurn Research and Development Corporation, which has been responsible for some of the latest advances in the power transmission field for industrial and governmental use. Amerigear-Zurn, Inc., reports Mr. Zurn, has established sales representation in 35 marketing centers throughout the United States. Major marketing will be to such industries as basic steel, aviation and automobile, marine, railroad, petroleum, rubber, chemical, mining and paper making.

## Special Southwestern Representative

James B. Zachry has been appointed Worthington Corporation special southwestern representative in charge of sales to gas pipeline companies, as recently announced by Worthington general sales manager W. A. Meiter. Associated with shop testing, application and sales of engines since joining Worthington in 1939, Mr. Zachry is an engine specialist and has been assigned to the Southwestern Regional Sales Organization for the past year to assist Worthington district offices in Tulsa, Dallas, Houston, New Orleans and El Paso in the sale of Worthington power engines and gas engine compressors.

In his new post, Mr. Zachry will continue to make his headquarters at Houston and in addition to his new assignment as special representative, will continue his former responsibilities.

## New Positions at M. Rosenblatt & Son

M. Rosenblatt & Son, naval architects and marine engineers of New York announce the recent retirement of William Young, chief engineer for the past four years. The executive structure of the organization has been revised by creation of two new posts. These are technical director, responsible for maintaining high standards of work, and head engineer, responsible for coordinating all projects in the office. Nathan Friedland has been appointed technical director and Richard H. Cooper, head project engineer, and in this capacity will be directly responsible to Mandell and Lester Rosenblatt for the work of the office.


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"F" Type FULL FLOW
For in-line installation at high flow rates—25 to 800 GPM. Uses new "FLO-PAC" pleated paper cartridge to remove particles down to one micron.

"M" Type MULTI-CARTRIDGE
Eleven sizes to choose from. Six types of cartridge refills including new "FLO-PAC" and "KLEER-PAC" available to give exact degree of filtration needed.

"B" Type BULK REFILL
For absolutely clean oil, bulk Cranite medium provides depth type purification. Bulk or cartridge type cellulose refills available for fine filtering.

All Models Have Quick-Opening Lids
Purifier lid is fastened with swing bolts. Lid swings back for easy access to refills.

Write for engineering bulletins and quotations on all three models.

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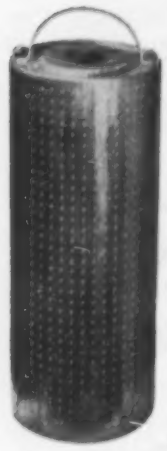

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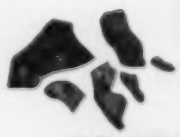

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This intricate, shattered compressor was put back to work after Southern Welding rebuilt it to "as-new" specifications at a fraction of the replacement cost. We specialize in "tough" problems. We can solve yours! Consult us before you discard it!

Cut expensive, non-productive down-time with Southern Welding's improved exchange service on all popular oil field industrial engine cylinder heads. All heads completely guaranteed. A call and it's on its way.

On all your repair problems, let our specialists help you "put it back to work, *fast*." Address inquiries to the Wichita Falls Plant.

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P.O. Box 2134, Wichita Falls, Texas 622 Clements, Odessa, Texas

## *Walnut cracks tough problem in lubrication*

## *—chooses* STANDARD HD OIL

**William G. Eslick, Plant Superintendent, goes over lubrication and overhaul records with Standard Oil lubrication specialist Albert J. Thomas. Working with customers to help crack tough lubrication problems is Al Thomas' business. Al has the training and experience for such jobs. A graduate of Iowa State College with a B.S. in Mechanical Engineering, Al joined Standard Oil in 1950. After completing Standard's Sales Engineering School, he began working with industrial accounts on their lubrication problems. Customers of Al's find his experience and training pay off for them.**

THERE WAS LUBRICATION TROUBLE in the power plant at Walnut, Iowa. The three diesel engines in the plant were experiencing stuck rings, excessive crankcase deposits and hard carbon deposits. Engines were sluggish and would not produce full power.

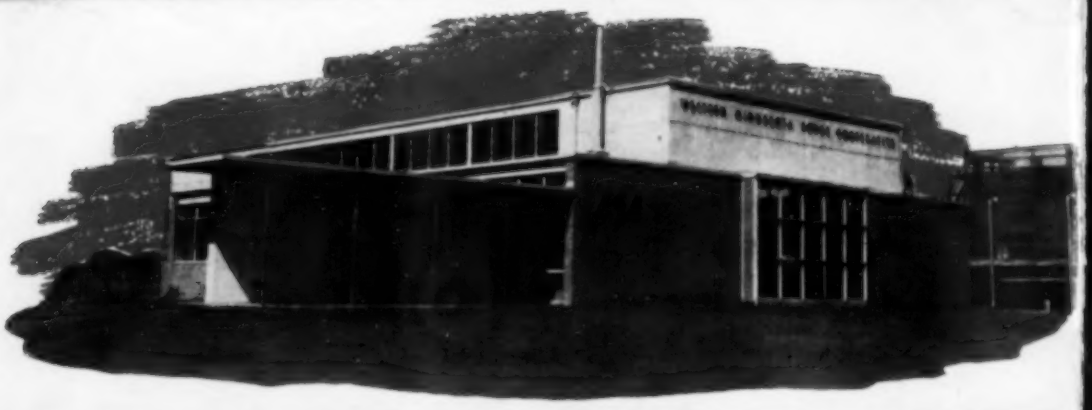
William G. Eslick, Plant Superintendent, working with Standard lubrication specialist, A. J. Thomas, decided on a course of action: he switched the engines to STANDARD HD Oil. Now, after more than 26,000 hours of operation, engines are clean. Ring sticking is eliminated, wear reduced to a minimum. Carbon deposits are reduced and remaining carbon is easily scavenged because it is now soft and flaky, not hard as before.

The initial fills of STANDARD HD Oil—plus make-up—are still in the engines. The community of Walnut, Iowa, is getting first rate electric service. Its power plant's lubrication problems have been licked. STANDARD HD Oil has again demonstrated its superior lubricating characteristics.

Perhaps you would like to know more about STANDARD HD Oil. In the Midwest a call to your nearby Standard Oil lubrication specialist will bring a prompt response. Or contact, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

**STANDARD OIL COMPANY** (Indiana)

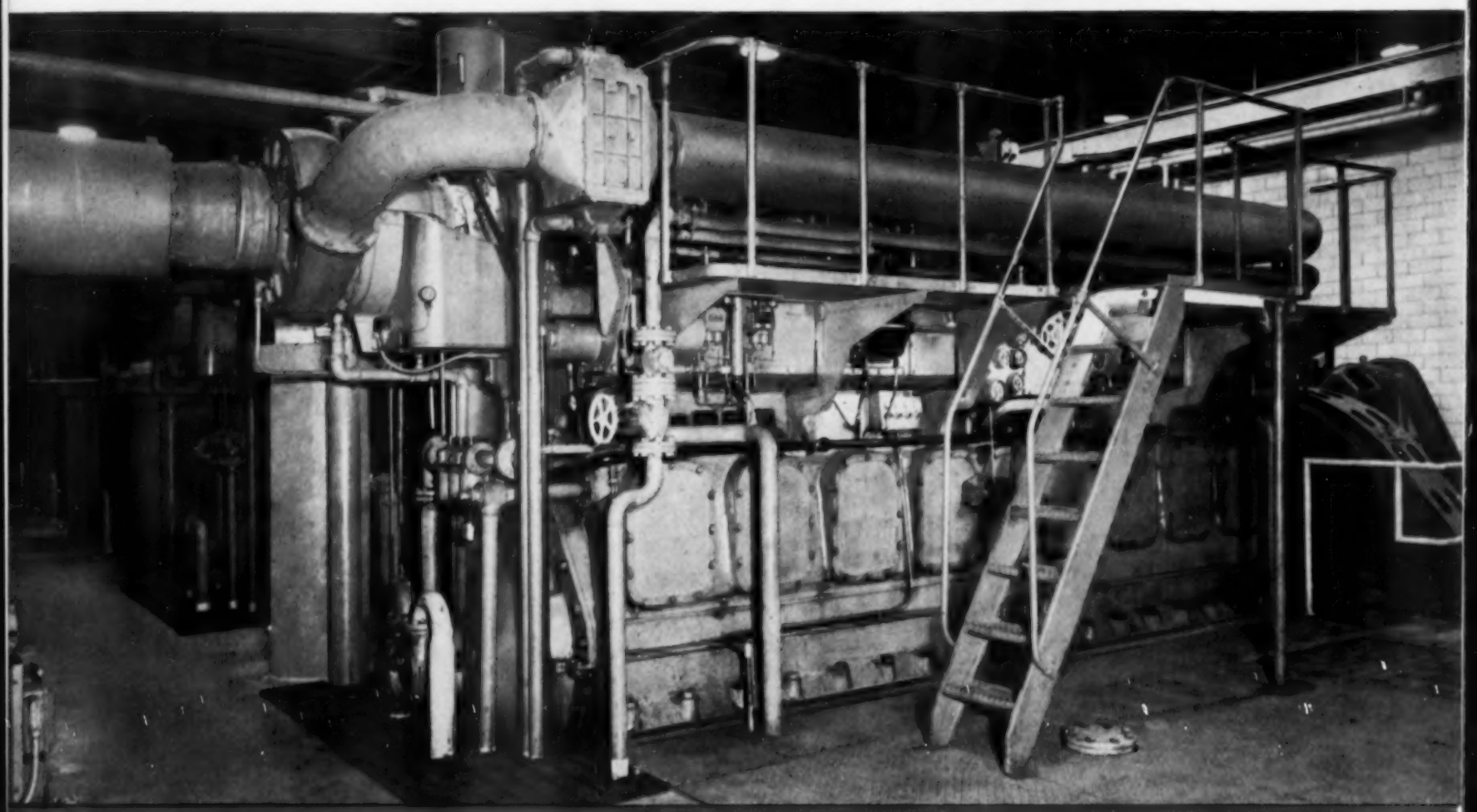
STANDARD



Exterior view of building:

The Agra Lite Cooperative near Benson, Minnesota houses five turbocharged Cooper-Bessemer Diesels, each rated 1850 hp at 327 rpm.

This view of Cooper-Bessemer Diesels at Benson shows after-coolers and exhaust-driven turbochargers. All five engines successfully use a No. 6 residual fuel oil.



# *How an "Oil Change" saved $30,000 ....in fueling Cooper-Bessemers*

The ability of Cooper-Bessemer Diesels to run smoothly and effectively on either heavy fuel, light crude, or a combination of both, is but one of many reasons why so many Cooper-Bessemer units are being installed in cost-conscious plants throughout the country.

Here's an example... switching five 1850 hp Cooper-Bessemer Diesels from a higher priced lighter engine fuel to No. 6 residual fuel oil, the Agra Lite R.E.A. Cooperative near Benson, Minnesota effected a one year net saving of $29,769... a remarkable 30% cost reduction.

And important to note is the fact that this "oil change" resulted in *no* increased wear on the smooth-operating turbocharged Cooper-Bessemers. In fact, the cleaning of valves, fuel pumps and nozzles periodically has shown these parts to be just as efficient, just as clean as when much lighter fuel was used.

Next time, why not check with Cooper-Bessemer for the ideal solution to *your* particular power problems.

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